Card and Service Configuration

This chapter describes how to configure the MGX 8850 cards and the services they support. Although the presumption for this chapter is that a plan exists for your network, it reviews some of the information that supports network planning. Generic instructions for inserting and removing cards appear in "Chapter 4, "Enclosure and Card Installation."

The services and applicable modules described in this chapter are:

- Physical and logical configuration of a broadband interface on the Processor Switching Module (PXM) and, for a stand-alone switch, connection addition
- ATM service on the MGX-AUSM/B
- Frame Relay service on the following service modules:

  MGX-FRSM-2CT3

  MGX-FRSM-2T3E3

  MGX-FRSM-HS2

  MGX-FRSM-HS1/B

  AX-FRSM-8T1 and AX-FRSM-8E1
- Circuit emulation service on the MGX-CESM-8T1 and MGX-CESM-8E1
- Redundancy and bulk distribution on the Service Resource Module-3T3 (MGX-SRM-3T3/B)

Note For information on the Route Processor Module (RPM), see the *Cisco Route Processor Module Installation and Configuration Guide*.

Tasks for Configuring Cards and Services

This section contains a general description of the sequence of tasks for configuring the cards and their services. It also contains details on how to configure resource partitions and add local connections and three-segment connections. Detailed descriptions of these tasks for individual cards appear in subsequent sections.

Modifying the Resource Partitioning

A resource partition at the card level consists of a number of logical connections (LCNs). At the port level, a resource partition consists of a percentage of bandwidth, a DLCI or VPI/VCI range, and the number of logical connection numbers (LCNs) available to a network control application. On the

PXM, the connections are global logical connections (GLCNs). By default, all resources on a a card or logical port are available to any controller on a first-come, first-served basis. If necessary, you can modify the resource partitioning at the card level or logical port level. Port-level resource modification follows card-level modification, so the available port-level resources depend on whether and how much you change the card-level resource partitioing. You do not have to change the resource partitioning for the card before changing resource partitioning for a port.

The current network control application is Portable AutoRoute (PAR). Planning considerations should include the possibility of modifying the partitioning of resources for the interface. For example, the MGX 8850 switch has the capacity to support a Cisco Multi-Protocol Label Switching (MPLS) controller or a Private Network to Network Interface (PNNI) controller.

Sequence of Configuration Tasks

In a new switch, the common approach is to configure the same aspect for all cards at once—adding logical ports to all applicable cards, for example. In contrast, the likely sequence for installing a single card is to begin with its card-level features and continue until you have configured every connection. The common tasks for a new switch are:

1. Optionally configure the service modules (except the RPM) for redundancy. This card-level operation requires redundant cards and possibly an MGX-SRM-3T3/B.
2. Optionally configure resource partitioning for the whole card if the default partitioning does not fulfill the purpose of the card.
3. Activate physical lines.
4. Configure the line if default parameters are not appropriate.
5. Create the logical ports then modify them as needed.
6. Optionally configure resource partitions for a logical port if the default partitioning does not support the intended operation of the port.
7. Add connections then modify them as needed.

Rules for Adding Connections

This section describes the rules for adding local connections, three-segment connections, and management connections. The MGX 8850 switch can support:

- Local-only, digital access and cross-connect (DAX) connections
- Three-segment connections across an ATM or Frame Relay network
- IP management connections (stand-alone switches only)

A management connection is an inband IP connection that lets a workstation control a local or remote MGX 8850 switch through a service module rather than the Ethernet port on a PXM-UI. Although the rules include references to CLI syntax, they also apply to the Cisco WAN Manager application.

Rules for Adding a DAX Connection

A DAX con is a connection whose endpoints for the entire connection exist on the same switch. The following apply to the MGX 8850 switch:

1. On a feeder, a DAX con can exist between different service modules or the same service module.
2. A stand-alone node supports DAX cons with one or both endpoints on the PXM in addition to DAX cons between service modules.
3. Either endpoint can be the master.
4. The first endpoint to add is the slave. The generic syntax is:

   addcon <*local parameters*>

   where *local parameters* are the port, DLCI or VPI and VCI, and mastership status. Slave is the default case, so you actually do not explicitly have to specify it. When you press Return, the system returns a connection identifier. The identifier includes the port and DLCI or VPI and VCI.

   Use the identifier to specify the slave endpoint when you subsequently add the connection at the master end. The slave endpoint is specified as the *remote parameters* in item 5.
5. To complete the DAX con, add the master endpoint. The generic syntax is

   addcon <*local parameters*> <*remote parameters*>

   where *local parameters* are the port, DLCI or VPI and VCI, and mastership status (master in this case). The *remote parameters* are the items in the connection identifier that the system returned when you added the slave endpoint.
6. If the endpoint is a PXM port in a stand-alone node, specify the slot as 0. The **addcon** command is the only command in which you specify the slot number for the PXM as 0.

Rules for Adding Three-Segment Connections

A three-segment connection consists of a local segment on each MGX 8850 switch at the edges of the network cloud and a middle segment across the network cloud. The MGX 8850 requirements are:

1. For MGX 8850 feeders, the backbone must consist of BPX 8600-series switches.
2. For MGX 8850 stand-alone switches, the backbone switches can be either BPX 8600-series switches or switches from another manufacturer.
3. On a feeder, the local segment exists between a service module and the PXM.
4. On a stand-alone node, the local segment can be between a service module and a port on the PXM or just two ports on the PXM.
5. For the local segment, add the connection at only the master endpoint. The generic syntax is:

   addcon <*local parameters*> <*remote parameters*>

   where *local parameters* are the port, DLCI or VPI and VCI, and mastership status (master in this case). The *remote parameters* are the current nodename, slot, port, and VPI and VCI of the slave end. For the PXM endpoints, specify the slot number as 0. The **addcon** command is the only command in which you specify the slot number for the PXM as 0.

Rules for Adding Management Connections

This section describes the requirements for adding an inband ATM PVC for managing an MGX 8850 stand-alone node. A management connection lets a workstation connected through a router control either the local MGX 8850 node or a remote MGX 8850 node that has no workstation. The typical configuration has the connecting router feed an AUSM/B, FRSM, RPM, or PXM UNI port.

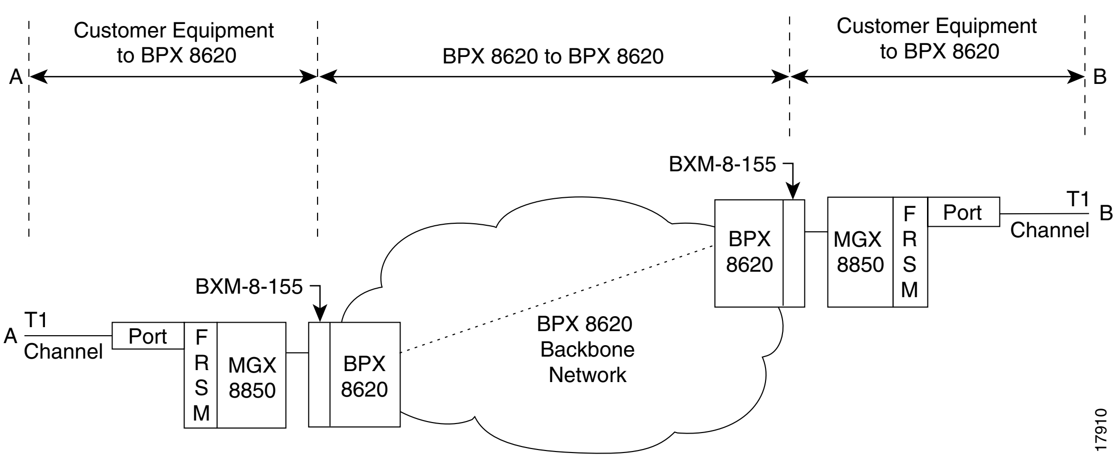
A management connection can be either a DAX con or a three-segment connection. The maximum number of management connections is eight. The DAX con exists between a service module or PXM UNI and port 34 of the local PXM. PXM port 34 is a reserved port for management connections on a stand-alone node. The network in Figure 6-1 shows FRSMs in a feeder application.

A three-segment management connection has a:

1. Local segment between a near-end service module or PXM UNI and a PXM port in the range 1–32.
2. Middle segment across the network cloud.
3. Local segment between a remote PXM port in the range 1–32 and port 34 of that same PXM.

The path from "A" to "B" in Figure 6-1 consists of three segments. A segment exists between the FRSM and the PXM on each MGX 8850 switch. The middle segment exists between the BXMs at the edges of the ATM cloud and may traverse BPX 8600 via nodes in the cloud. The VPI and VCI at each BPX8600-series switch connected to an MGX 8850 feeder must match the VPI and VCI on the slave endpoint of the connected PXM. The VPIs and VCIs at the endpoints of the middle segment do not have to match. If you use the CLI rather than the Cisco WAN Manager application, add each segment through the CLI at each switch.

Figure 6-1 Frame Relay Connection Through an MGX 8850-BPX 8600-Series Network



The Processor Switching Module

This section first describes how to activate and configure the card-level parameters, lines, and ports on the PXM uplink card then describes how to add connections to the PXM in a stand-alone node. The descriptions tell you how to:

- Optionally modify the resource partitioning at the card level.
- Activate a line on the *uplink* card. On a stand-alone node, you can activate more than one line if the uplink card has multiple lines. One physical line must be the trunk to a network routing node.
- If the switch has a pair of SRMs for bulk distribution and you use the CLI rather than the CiscoView application, activate the SRM lines from the PXM.
- Optionally modify the resource partitioning at the port level.
- Create logical ports.
- On a stand-alone node, specify the cell header type. UNI cell headers typically apply where a workstation connects to a UNI port on the uplink card rather than a port on the PXM-UI card. Such an implementation is not common.
- On a stand-alone node, add standard connections and optional management connections.
- On a stand-alone node, configure Automatic Protection Switching (APS).
- For a feeder, execute steps on the connected BPX 8600-series switch to make the feeder an available resource in the network.

Note For a description of the bit error rate test (BERT) functions, see the section titled “Bit Error Rate Testing Through an MGX-SRM-3T3.”

Configuring Card-Level Parameters, Lines, and Ports

This section describes how to configure card-level features, activate a physical line, and configure logical elements such as a port. If necessary, refer to the section titled "Tasks for Configuring Cards and Services" for background information on these types of tasks.

Step 1 Optionally, you can modify the resource partitioning for the whole card by executing **cnfcdrscprtn**. You can view resource partitioning through **dspcdrscprtn**.

cnfcdrscprtn <*number_PAR_conns*> <*number_PNNI_conns*> <*number_TAG_conns*>

- *number_PAR_conns* is the number of connections in the range 0–32767 for PAR.
- *number_PNNI_conns* is the number in the range 0–32767 available to PNNI.
- *number_TAG_conns* is the number of connections in the range 0–32767 for MPLS.

For example, you could reserve 10,000 connections for each controller on the PXM with:

cnfcdrscprtn 10000 10000 10000

Step 2 Activate a line by executing **addln**:

addln -ds3 <*slot.line*> | -e3 <*slot.line*> | -sonet <*slot.line*>

- -ds3 indicates a T3 line parameter follows.
- -e3 indicates an E3 line parameter follows.
- -sonet indicates an OC-3 or OC-12 line parameter follows.
- *slot* is 7 or 8 for the PXM. If the switch has a single of redundant pair of SRMs, execute **addln** for slots 15, 16, 31, and 32.
- *line* has the range 1–4 but depends on the number of lines on the back card.

For a feeder, you can activate only one line. For a stand-alone, you can activate more than one line if the back card has multiple lines. One line must serve as the trunk to the ATM network. With an OC-3, T3, or E3 card, remaining lines can serve as UNI ports to CPE.

Step 3 If necessary, modify the characteristics of a line by using **cnfln**.

Step 4 Configure logical ports for the physical line by executing **addport**. Execute **addport** once for each logical port. Related commands are **cnfport**, **dspports**, and **delport**.

addport <*port_num*> <*line_num*> <*pct_bw*> <*min_vpi*> <*max_vpi*>

- *port_num* is the number for the logical port. The range is 1–32 for user-ports or 34 for inband ATM PVCs that serve as management connections.
- *line_num* is the line number in the range 1–4 but depends on the type of uplink card.
- *pct_bw* is the percentage of bandwidth. The range is 0–100. This parameter applies to both ingress and egress.
- *min_vpi* is the minimum VPI value. On a feeder, the range is 0–4095. On a stand-alone node, the range is 0–255.
- *max_vpi* is the maximum VPI value. On a feeder, the range is 0–4095. On a stand-alone node, the range is 0–255.

Using an example of 100% of the bandwidth on one logical port 1:

addport 1 1 100 1 200

where the first “1” is the logical port number; the second “1” is the line number on the PXM back card to which you are assigning this logical port number; “100” is the percentage of bandwidth this port has in both directions; and the VPI range is 1–200.

Step 5 If necessary, use **cnfportrscprtn** to modify port-level resources for a controller:

cnfportrscprtn <*port_no*> <*controller*> <*ingress_%BW*> <*egress_%BW*>

- <*min_VPI*> <*max_VPI*> <*min_VCI*> <*max_VCI*> <*max_GLCNs*>
- *port_no* is the logical port number in the range 1–32 for user-connections or 34 for inband ATM PVCs for network management.
- *controller* is a string identifying the network controller—”PAR,” “PNNI,” or “TAG.”
- *ingress_%BW* is the percentage of ingress bandwidth in the range 0–100.
- *egress_%BW* is the percentage of egress bandwidth in the range 0–100.
- *min_vpi* is the minimum VPI in the range 0–4095.
- *max_vpi* is the maximum VPI in the range 0–4095.
- *min_vci* is the minimum VCI in the range 0–65535.
- *max_vci* is the maximum VCI in the range 0–65535.
- *max_chans* is the maximum GLCNS in the range 0–32767.

Step 6 On a stand-alone node, specify the cell header type as needed by executing **cnfatmln**.

cnfatmln <*line_num*> <*type*>

- *line_num* is the line number in the range 1–4.
- *type* is either 2 for UNI or 3 for NNI (the default).

UNI cell headers typically apply where a workstation connects through a line to a PXM UNI port (rather than a SLIP-based port on the PXM-UI card). Such an implementation is not common, so **cnfatmln** usually is not necessary.

Automatic Protection Switching on the PXM

Automatic Protection Switching (APS) provides redundancy for an OC-3 or OC-12 line on the PXM if a failure occurs someplace other than the PXM front card. The failure can originate on the daughter card, uplink card, or any part of the physical line. With APS, the active PXM remains active and passes the cells from the failed line-path through the redundant line. The advantage of APS is that a line switchover requires significantly less time than a full PXM switchover. (A failure of the PXM front card in a redundant system causes the entire PXM card set to switch over.) As defined in GR-253, a variety of APS modalities are possible (see the command summaries that follow).

The current requirements for APS service on an MGX 8850 switch are:

- Redundant PXMs (currently, the PXM does not support an APS configuration where the working and protection lines on the same uplink card).
- A “B” version of an OC-3 or OC-12 back card (SMLR-1-622/B, and so on).
- The connected network switch or CPE must also support APS.

Initial APS specification consists of the *working* and *protection* slot and line and the *mode* for APS. After the initial APS specification, you can configure additional APS parameters, give commands for switching lines, and display the APS configuration. The CiscoView application and CLI provide access to the APS feature. For detailed descriptions of the CLI commands, see the *Cisco MGX 8850 Wide Area Edge Switch Command Reference*. Note that APS is available for only the "B" versions of the SONET cards—SMLR-1-622/B, and so on. The applicable CLI commands are:

- **addapsln** to specify the lines and mode for APS
- **cnfapsln** to modify the following details of APS operation:
  - — error thresholds
  - — wait period before the PXM restores the working line after errors clear
  - — unidirectional or bidirectional switchover, which specifies whether one or both directions of a line are switched when the criteria for a hard or soft failure are met for *one* direction
  - — *revertive* recovery, where the working line automatically returns to operation after errors clear and any wait period has elapsed
  - — enable use of K1 and K2 bytes in the line-level frame for equipment at both ends to exchange APS-related information
- **delapsln** to delete the APS configuration
- **dspapsln** to display the configuration for an APS-configured line
- **switchapsln** to issue commands for line switching that:
  - — clear previous user requests
  - — lock out (block) line switching
  - — manually switch to the protection line if the following are true: no errors exist, the working line is active, and your request has an equal or higher priority than the last switch request.
  - — force a line switch regardless of existing errors the following are true: the working line is active and your request has an equal or higher priority than the last switch request.
  - — switch all traffic to either the working lines or protection lines so you can remove a card (applies to only the currently supported configuration of 1+1 mode on two uplink cards)

To specify APS, use the following syntax:

addapsln <*workline*> <*workingslot*> <*protectionline*> <*protectionslot*> <*archmode*>

where *workline* and *workingslot* identify the line and slot of the APS working line, and *protectionline* and *protectionslot* identify the protection line and slot. According to GR-253, the *archmode* identifies the type of APS operation. The mode definition includes:

1. 1+1 on one back card
2. 1+1 on two back cards
3. 1:1
4. Annex B

Currently, the only supported mode is 1+1 with two uplink cards (*mode*=2). With 1+1 APS, both the working line and the protection line carry duplicate data even though no error threshold has been exceeded or line break has occurred. This mode requires that two standard cables (rather than a Y-cable) connect at two ports on the equipment at the opposite end. With the two-card implementation, *workline* must be the same as *protectionline*.

Adding Connections on a PXM in a Stand-Alone Node

This section describes the CLI commands for provisioning connections on a PXM in a stand-alone node. Connection addition abides by the rules for a standard connection or a management connection in the form of either a three-segment connection or a DAX con. See "Rules for Adding Connections" earlier in this chapter. In addition this section describes the commands for modifying certain features for a connection and policing connections by way of usage parameter control.

The CLI commands correspond to functions in the Cisco WAN Manager application. The preferred CLI command is **addcon**. (If the application requires NSAP addressing, use **addchan** to add the connection and **cnfchan** if you need to modify it. Refer to the command reference for the syntax.) In addition, On the PXM CLI:

Step 1 Execute the **addcon** command according to the following syntax:

addcon <*port_num*> <*conn_type*> <*local_VPI*> <*local_VCI*> <*service*> [*CAC*] [*mastership*] [*remoteConnId*]

- *port_no* is the logical port in the range 1–32 for a user connection or 34 for management connection.
- *conn_type* is a number identifying the connection type—1 for VPC or 2 for VCC.
- *local_VPI* is the local VPI in the range 0–4095.
- *local_VCI* is the local VCI in the range 0–65535.
- *service* is a number in the range 1–4 to specify the type of service: 1=CBR, 2=VBR, 3=ABR, and 4=UBR.
- *CAC* optionally lets you turn off the addition of the loading affect of a connection to the aggregated load on a port.
- *mastership* specifies whether the endpoint you are adding is the master or slave. 1=master. 2=slave (default). The syntax shows this parameter as optional because you need to enter it at only the master end. Slave is the default, so you do not explicitly need to specify it when entering a DAX con.
- *remoteConnId* identifies the connection at the slave end. The format for *remoteConnId* is *Remote_nodename.slot_num.remote_VPI.remoteVCI*. Note that the slot number of the active PXM is always 0 when you add a connection because the PXM slot number is a fixed, logical value.

Step 2 If necessary, modify a connection by using **cnfcon**:

cnfcon <*conn_ID*> <*route_priority*> <*max_cost*> <*restrict_trunk_type*> [CAC]

- *conn_ID* identifies the connection. The format is *logical_port.VPI.VCI*.
- *route_priority* is the priority of the connection for re-routing. The range is 1–15 and is meaningful only in relation to the priority of other connections.
- *max_cost* is a number establishing the maximum cost of the connection route. The range is 1–255 and is meaningful only in relation to the cost of other connections for which you specify a maximum cost.
- *restrict_trunk_type* is a number that specifies the type of trunk this connection can traverse. The numbers are 1 for no restriction, 2 for terrestrial trunk only, and 3 for satellite trunk only.
- *CAC* optionally lets you turn on or off the addition of the loading affect of a connection to the aggregated load on a port.

Step 3 As needed, specify usage parameter control according to the connection type. Use either **cnfupccbr**, **cnfupcvbr**, **cnfupcabr**, or **cnfupcubr**. The following text lists the parameters for each. Note that the parameters for **cnfupcvbr** and **cnfupcabr** are the same. Also, the *polType* (policing type) parameter has numerous variations in accordance with ATM Forum v4.0. For a list of the policing variations, see Table 6-1 after the syntax descriptions.

cnfupccbr *<conn_ID> <polType> <pcr[0+1]> <cdvt[0+1]> <IngPcUtil> <EgSrvRate> <EgPcUtil>*

- *conn_ID* identifies the connection. The format is *port.vpi.vci.*
- *polType* is the policing type. The choices are 4 or 5. See Table 6-1 for a description of these types.
- *pcr* is the peak call rate in the range 50–1412832 cps.
- *cdvt* is the cell delay variation tolerance in the range 1–5000000 microseconds.
- *IngPcUtil* is the percentage of utilization on the ingress. The range is 1–100.
- *EgSrvRate* is the egress service rate. The range is 50–1412832 cps.
- *EgPcUtil* is the percentage of utilization on the egress. The range is 1–100.

cnfupcvbr or **cnfupcabr** <*conn_ID*> <*polType*> <*pcr*[0+1] < *cdvt*[0+1]> <*scr*> <*mbs*> <*IngPcUtil*> <*EgSrvRate*> <*EgPcUtil*>

- *conn_ID* identifies the connection. The format is *port.vpi.vci.*
- *polType* is the policing type in the range 1– 5. See Table 6-1 for a list of these types.
- *pcr* is the peak call rate in the range 50–1412832 cps.
- *cdvt* is the cell delay variation tolerance in the range 1–5000000 microseconds.
- *scr* is the sustained cell rate. The range is 50–1412832 cps.
- *mbs* is the maximum burst size. The range is 1–5000000 cells.
- *IngPcUtil* is the percentage of utilization on the ingress. The range is 1–100.
- *EgSrvRate* is the egress service rate. The range is 50–1412832 cps.
- *EgPcUtil* is the percentage of utilization on the egress. The range is 1–100.

cnfupcubr <*conn_ID*> <*polType*> <*pcr*[0+1] < *cdvt*[0+1]> <*IngPcUtil*>

- *conn_ID* identifies the connection. The format is *port.vpi.vci.*
- *polType* is the policing type. The range is 3– 5. See Table 6-1 for a list of these types.
- *pcr* is the peak call rate in the range 50–1412832 cps.
- *cdvt* is the cell delay variation tolerance in the range 1–5000000 microseconds.
- *IngPcUtil* is the percentage of utilization on the ingress. The range is 1–100.

Table 6-1 Policing Definitions According to Policing and Connection Type

Policing by Connection Type	ATM Forum TM spec. 4.0 conformance definition	PCR Flow (1st leaky bucket)	CLP tagging (for PCR flow)	SCR Flow (2nd leaky bucket)	CLP tagging (for SCR flow)
CBR polType=4	CBR.1 (PCR Policing only)	CLP(0+1)	no	off	n/a
CBR polType=5	When policing = 5 (off)	off	n/a	off	n/a
UBR polType=3	UBR.1 when CLP setting = no	CLP(0+1)	no	off	n/a
UBR polType=4	UBR.2 when CLP setting = yes	CLP(0+1)	no	CLP(0)	yes
UBR polType=5	Policing is off	off	n/a	off	n/a
VBR polType=1	VBR.1 1	CLP(0+1)	no	CLP(0+1)	no
VBR polType=2	VBR.2	CLP(0+1)	no	CLP(0)	no
VBR polType=3	VBR.3	CLP(0+1)	no	CLP(0)	yes
VBR polType=4	(when Policing = 4)	CLP(0+1)	no	off	n/a
VBR polType=5	Policing is off	off	n/a	off	n/a

ATM Universal Service Module

The eight-port ATM Universal Service Module (MGX-AUSM/B-8T1 and MGX-AUSM/B-E1) is a multipurpose card set with eight T1 or E1 lines that support:

- ATM UNI with high port-density for the CPE—with AUSMs in all 24 service module slots, an MGX 8850 switch can support up to 192 individual T1 or E1 lines. An individual card set can support 1000 data connections and 16 management connections.
- Inverse multiplexing for ATM (IMA) that complies with ATM Forum v3.0 and v3.1—the 8-port AUSM can provide *N* x T1 or *N* x E1 logical ports up to maximum rates of 12 Mbps for T1 or 16 Mbps for E1.
- Classes of service—CBR, VBR, ABR, and UBR with per-VC queuing on ingress and multiple class-of-service queues on egress.
- Statistics collection.
- Virtual path connections (VPCs).
- Network synchronization derived from one of its lines.
- Bit error rate test (BERT) functionality with loopback pattern generation and verification on individual lines or logical port. For a description of the BERT functions, see the section titled "Bit Error Rate Testing Through an MGX-SRM-3T3."
- 1:N redundancy for through the optional MGX-SRM-3T3/B card.
- Automatic card-restore.
- SNMP and TFTP to support card and connection management.
- Resource partitions for individual network control applications.

Using the CLI to Configure the Card, Lines, and Ports

You can activate and configure the card, the lines, and the ports on the AUSM-series cards through the CiscoView application or the CLI. To perform connection-related tasks, use the Cisco WAN Manager application or the CLI. Refer to the documentation for these applications for task descriptions. Use the commands described in this section to:

- Optionally modify resource partitioning at the card-level
- Activate and configure a line
- Create and configure a logical port
- Optionally modify resource partitioning at the port-level
- Configure usage parameters
- Configure queue depths
- Configure the ForeSight feature
- Configure a line as a clock source

On the CLI of the AUSM/B:

Step 1 If necessary, modify the resource partitioning for the whole card by executing the **cnfcdrscprtn** command. You can view resource partitioning through **dspcdrscprtn**.

cnfcdrscprtn <*number_PAR_conns* | *number_PNNI_conns* | *number_TAG_conns*>

- *number_PAR_conns* is the number of connections in the range 0–1000 for PAR.
- *number_PNNI_conns* is the number of connections in the range 0–1000 for PNNI.
- *number_TAG_conns* is the number of connections in the range 0–1000 for MPLS.

For example, you could reserve 300 connections for each controller on the AUSM with:

cnfcdrscprtn 300 300 300

Step 2 Activate a physical line by using **addln** for each of the eight lines as need**ed**:

addln <*line_number*>

Step 3 Optionally, use the **cnfln** command to specify line coding, line length, and clock source:

cnfln <*line_num*> <*line_code*> <*line_len*> <*clk_src*> [*E1-signaling*]

Step 4 Execute **upport** to activate the logical operation of the line:

upport <*port_number*>, where *port_number* is in the range 1–8.

Step 5 If necessary, execute **cnfportq** to modify the egress queues:

cnfportq <*port_num*> <*q_num*> <*q_algo*> <*q_depth*> <*clp_high*> <*clp_low*> <*efci_thres*>

port_num	is the logical port number in the range 1–8.
q_num	is the queue number in the range 1–16. 0 is the default for **addchan**. 1=CBR 2=VBR 3=ABR 4=UBR
q_algo	is a number to specify the queue algorithm: 0=disable queue 1=high priority—always serve 2=best available 3=minimum guaranteed bandwidth 4=minimum guaranteed bandwidth with maximum rate shaping 5=CBR with smoothing
q_depth	is the maximum queue depth in the range 1–16000 cells.
clp_high	is the high cell loss priority in the range 1–16000 cells.
clp_low	is the low cell loss priority in the range 1–16000 cells.
efci_thres	is the EFCI threshold in the range 1–16000 cells.

Step 6 If necessary, configure resources at the port level by executing **cnfportrscprtn**. Use **dspportrscprtn** to see the current resource partitioning.

cnfportrscprtn <*port_num*> <*controller*> <*ingress_%BW*> <*egress_%BW*> <*number_of_cons*> <*VPImin/VPImax*> [*VCImin/VCImax*]

- *port_num* is the port number in the range 1–8.
- *controller* is a number representing the controller: 1=PAR, 2=PNNI, and 3=MPLS.
- *ingress_%BW* is the percentage of ingress bandwidth in the range 0–100.
- *egress_%BW* is the percentage of egress bandwidth in the range 0–100.
- *number_of_cons* is the maximum number of connections on the port.
- *VPImin/VPImax* is the minimum and maximum VPI numbers.
- *VCImin/VCImax* is the optional specification for VCI range.

Using the CLI to Configure Inverse Multiplexing

The command sequence for configuring the IMA feature:

Step 1 **addln** on all constituent links.

Step 2 **cnfln** if necessary.

Step 3 **addimagrp** (or addaimgrp) to create the IMA group by using the following syntax:

addimagrp <*group_num*> <*port_type*> <*list_of_links*> <*minNumLink*>

group_num	is a number for IMA group. The range is 1–8.
port_type	is the port type: 1=UNI, 2=NN1.
list_of_links	is the list of links to be included in the group. Separate each link number by a period.
minNumLink	is the minimum number of links in the range 1–8 to form a group.

For example: the following creates IMA group 1 with lines 3, 4, and 5. The minimum is 3.

```
addimagrp 1 3.4.5 3
```

IMA-related commands are **dspimagrp**, **dspimagrpcnt**, **dspimagrps**, **dspimainfo**, and **dspimalncnt**. Refer to the *Cisco MGX 8850 Wide Area Edge Switch Command Reference* for descriptions.

Adding and Configuring Connections on the AUSM/B

You can add and modify connections through the Cisco WAN Manager or the CLI. Refer to applicable documentation if you use the WAN Manager application. This section describes how to add an ATM connection through the CLI according to the rules for adding a standard connection or a management connection in the form of either a DAX con or a three-segment connection. See “Rules for Adding Connections” earlier in this chapter.

On the CLI of the AUSM/B:

Step 1 Execute the **addcon** command.

When you add a connection with **addcon**, the system automatically assigns the next available *channel number*, so **addcon** does not require it. However, some related commands require a channel number—**cnfchanfst**, **cnfchanq**, and **cnfupcabr**, for example. To see the channel number after you add a connection, use **dspcons**.

The **addcon** syntax is:

addcon <*port_number*> <*vpi*> <*vci*> <*ConType*> <*SrvType*> [*Controller_Type*] [*mastership*] [*remoteConnID*]

port number	port number is in the range 1–8.
vpi	vpi has a value in the range 0–255.
vci	vci can be in the range 0–65535 for a VCC or * for a VPC.
Conn type	is the connection type: 0=VCC, and non-0 is the local ID of a VPC in the range 1–1000.
Service Type	is the service type: 1=CBR, 2=VBR, 3=ABR, and 4=UBR.
mastership	is the mastership status of the endpoint. 1=master, and 2=slave. The default is slave, so you actually do not need to type a 2.
Controller_Type	is the optional controller specification. 1=PAR (the default}. 2=SPVC (PNNI).
connID	is entered at only the master end and consists of the node name, slot number, port number, vci, and vpi of the slave end.

Step 2 To configure usage parameter control (UPC) for the connection (channel), use **cnfupccbr**, **cnfupcvbr**, **cnfupcabr**, or **cnfupcubr**. Use **dspcons** to obtain the channel number.

cnfupccbr <*port.vpi.vci*> <*enable/disable*> <*pcr*[0+1]> <*cdvt*[0+1]> <*IngPcUtil*> <*EgSrvRate*> <*EgPcUtil*>

port.vpi.vci	identifies the connection.
enable/disable	is the UPC enable: 1=disable, 2=enable.
pcr[0+1]	is the peak cell rate. Without IMA, the range is as follows: T1, 10–3622 cells per second E1, 10–4528 cells per second clear E1, 10–4830 cells per second For IMA, multiply the line rate by the number of links.
cdvt[0+1]	is the cell delay variation tolerance for cells with CLP=0 and CLP=1. The range is 1–250000 micro seconds.
IngPcUtil	is the percent utilization on the ingress. The range is 1–127. The default is 0.

EgSrvRate is the egress service rate. Without IMA, the range is as follows:

T1, 10–3622 cells per second
E1, 10–4528 cells per second
clear E1, 10–4830 cells per second

For IMA, multiply the line rate by the number of links.

EgrPcUtil is the percent utilization on the egress. The range is 1–127. The default is 0.

cnfupcvbr has the same syntax and parameters as **cnfupcabr**

cnfupcvbr or **cnfupcabr** <*port.vpi.vci*> <*enable*> <*pcr*[0+1]> <*cdvt*[0+1]> <*scr*> <*scr_police*> <*mbs*> <*IngPcUtil*> <*EgSrvRate*> <*EgPcUtil*> <*clp_tag*>

port.vpi.vci identifies the connection.

enable is the enabled/disable for UPC: 1=Disable, 2=Enable.

pcr is the peak cell rate. Without IMA, the range is as follows:

T1, 10–3622 cells per second
E1, 10–4528 cells per second
clear E1, 10–4830 cells per second

For IMA, multiply the line rate by the number of links.

cdvt cdvt[0+1] is the cell delay variation tolerance for cells with CLP=[0+1]. The range is 1–250000 micro seconds.

scr is the peak cell rate. Without IMA, the range is as follows:

T1, 10–3622 cells per second
E1, 10–4528 cells per second
clear E1, 10–4830 cells per second

For IMA, multiply the line rate by the number of links.

scr_police specifies the type of scr policing: 1= CLP[0] cells, 2=CLP[0+1] cells, and 3=no SCR policing.

mbs is the maximum burst size: the range is 1–5000 cells.

IngPcUtil is the percent utilization on the egress. The range is 1–127. The default is 0.

EgSrvRate is the egress service rate. Without IMA, the range is as follows:

T1, 10–3622
E1, 10–4528
clear E1, 10–4830

For IMA, multiply the line rate by the number of links.

EgrPcUtil is the percent utilization on the ingress. The range is 1–127. The default is 0.

clp_tag is the enable for CLP tagging: 1=disable, 2=enable.

cnfupcubr <*port.vpi.vci*> <*enable*> <*pcr*[0+1]> <*cdvt*[0+1]> <*IngPc*> <*util*> <*clp_tag*>

port.vpi.vci	identifies the connection.
enable	is the enabled/disable for UPC: 1=Disable, 2=Enable.
pcr	is the peak cell rate. Without IMA, the range is: T1, 10–3622 E1, 10–4528 clear E1, 10–4830 For IMA, multiply the line rate by the number of links.
cdvt	cdvt[0+1] is the cell delay variation tolerance for cells with CLP=[0+1]. The range is 1–250000 micro seconds.
scr	is the peak cell rate. Without IMA, the range is: T1, 10–3622 E1, 10–4528 clear E1, 10–4830 For IMA, multiply the line rate by the number of links.
scr_police	specifies the type of scr policing: 1= CLP[0] Cells, 2=CLP[0+1] cells, and 3=no SCR policing.
mbs	is the maximum burst size: the range is 1–5000 cells.
IngPc	is the percent utilization on the ingress. The range is 1–127. The default is 0.
hclp_tag	is the enable for CLP tagging: 1=disable, 2=enable.

Step 3 If the system has the ForeSight feature, use **cnfchanfst** to configure it.

cnfchanfst <*port.vpi.vci*> <*enable*> <*fgcra_enable*> <*ibs*> <*pcr*> <*mcr*> <*icr*>

port.vpi.vci	identifies the connection.
enable	is the enabled/disable for the ForeSight feature: 1=disable, 2=enable.
fgcra_enable	is the enabled/disable for the frame-based generic cell rate algorithm: 1=disable, 2=enable.
ibs	is the initial burst size in the range 0–5000 cells.
pcr	is the peak cell rate. Without IMA, the range is: T1, 10–3622 E1, 10–4528 clear E1, 10–4830 For IMA, multiply the line rate by the number of links.

mcr	is the minimum cell rate. Without IMA, the range is: T1, 0–3622 E1, 0–4528 clear E1, 0–4830 For IMA, multiply the line rate by the number of links.
icr	is the initial cell rate. Without IMA, the range is as follows: T1, 0–3622 E1, 0–4528 clear E1, 0–4830 For IMA, multiply the line rate by the number of links.

Step 4 If necessary, change the queue depths by using **cnfchanq**.

cnfchanq <*port.vpi.vci*> <*discard_option*> <*vc_q_depth*> <*clp_thresh_high*> <*clp_thresh_low* | *epd_threshold*> <*efci_thresh*>

port.vpi.vci	identifies the connection.
discard_option	is either 1 for CLP hysteresis or 2 for frame-based.
vc_q_depth	is the ingress queue depth in the range 1–16000 cells.
clp_thresh_high	is the CLP high threshold in the range 1–16000 cells.
clp_thresh_low or *epd_threshold*	is the CLP low threshold in the range 1–16000 cells for CLP hysteresis-based discard. or is the EPD threshold in the range 1–16000 cells frame-based discard.
efci_thresh	is the EFCI threshold in the range 1–16000 cells.

BPX 8600-to-BPX 8600 Segment

For the middle segment, be sure to use the connection type as the local segments on the MGX 8850 node (CBR, VBR, ABR, or UBR). The parameters directly map from those specified at the connection endpoint.

Frame Service Module Features

This section describes the features available on each of the Frame Service Modules (FRSMs). For descriptions of how to set up these cards and add connections, see the subsequent section titled "Configuring Frame Relay Service." This section consists of:

- Brief descriptions of each model of the FRSM
- Lists of features shared by all FRSMs
- Lists of features for individual models of the FRSM
- Brief descriptions of the services

Introduction

The primary function of the FRSM is to convert between the Frame Relay-formatted data and ATM/AAL5 cell-formatted data. For an individual connection, you can configure network interworking (NIW), service interworking (SIW), ATM to Frame Relay UNI (FUNI), or frame forwarding. An FRSM converts the header format and translates the address for:

- Frame Relay port number and DLCI
- ATM-Frame UNI (FUNI) port number and frame address or frame forwarding port
- ATM virtual connection identifier (VPI/VCI)

Types of Frame Service Modules

The models of the FRSM include eight-port T1 and E1 cards and very high-speed modules. Higher speed modules support unchannelized E3 and HSSI as well as channelized and unchannelized T3.

Very High Speed Frame Service Modules

The Very High Speed Frame Service Modules (FRSM-VHS) support Frame Relay services on T3, E3, and HSSI interfaces. Up to 24 FRSM-VHS cards in any combination can operate in the switch. They should occupy upper slots whenever possible. The FRSM-VHS group on an MGX 8850 node consists of the:

- MGX-FRSM-2CT3, which provides channelized Frame Relay service for up to 1000 user connections over two T3 lines on the BNC-2T3 back card (or line module).
- MGX-FRSM-2T3E3, which provides unchannelized (clear-channel) Frame Relay service for up to 1000 user connections over two T3 lines (44.736 Mbps each) or two E3 lines (34.368 Mbps each) on a BNC-2T3 or BNC-2E3 back card. The MGX-FRSM-2T3E3 can also support subrate T3 or E3 for tiered DS3 on each physical port.
- MGX-FRSM-HS2, which provides unchannelized Frame Relay service for up to 1000 user-connections over two HSSI lines on the SCSI2-2HSSI back card. The maximum rate for the card is 70 Mbps. Each port can operate either as DTE or DCE with incremental rates of NxT1 or NxE1 up to 52 Mbps.

Eight-Port Channelized and Unchannelized Frame Service Module

The AX-FRSM-8T1 and AX-FRSM-8E1 provide unchannelized Frame Relay service for up to 1000 user-connections on 8 T1 or E1 lines. The AX-FRSM-8T1c and AX-FRSM-8E1c provide channelized Frame Relay service for up to 1000 connections.

Four-Port Unchannelized Frame Service Module for V.35

The MGX-FRSM-HS1/B provides unchannelized Frame Relay service across four V.35 lines. The maximum throughput for the card is 16 Mbps. The maximum rate on a line is 8 Mbps. Without the cost of a T3 or E3 card, the MGX-FRSM-HS1/B provides greater that T1 or E1 speeds on a port as well as a choice of 50 line rates in the range 48 Kbps–8 Mbps.

Frame Service Module Features

This section first lists the features common to all FRSM models then lists the features of each model. All FRSMs support:

- Frame Relay-to-ATM Network Interworking (NIW) as defined in FRF.5.
- Frame Relay-to-ATM Service Interworking (SIW) with or without translation as in FRF.8.
- Frame forwarding.
- ATM Frame-UNI.
- Maximum frame sizes of 4510 bytes for Frame Relay and 4096 bytes for ATM-FUNI.
- Per-virtual-circuit (VC) queuing in the ingress direction (towards the Cellbus). Traffic arriving at the network on a connection has a dynamically assigned buffer at the entrance to the switch. Buffer size depends on the amount of traffic and the service-level agreement (SLA).
- Advanced buffer management. When a frame arrives, the depth of the queue for the LCN is compared against the peak queue depth scaled down by a specified factor. The scale-down factor depends on the amount of congestion in the free buffer pool. As the free buffer pool begins to empty, the scale-down factor is increased, preventing an excessive number of buffers from being held up by any single LCN.
- Multiple, priority-level queuing to support class of service on the egress. The FRSM services egress queues according to a weighted priority. The priority depends on the percentage of logical port bandwidth needed by all connections of a particular type on a port. The FRSM supports a:
  - High-priority queue
  - Real-time Variable Bit Rate (rt-VBR) queue
  - Common queue for non-real-time Variable Bit Rate (nrt-VBR) and ABR connections
  - UBR queue
- Initial burst per channel. After a period of silence, the FRSM sends a configurable number of bytes at a peak service rate.
- The ForeSight option. This Cisco mechanism for managing congestion and optimizing bandwidth continuously monitors the utilization of ATM trunks. It proactively adjusts the bandwidth for connections to avoid queuing delays and cell discards.
- Consolidated Link Layer Management (CLLM), an out-of-band mechanism to transport congestion related information to the far end.
- Dual leaky bucket policing. Within the basic parameters such as committed burst, excess burst, and CIR, incoming frames go into two buckets: those to be checked for compliance with the committed burst rate and those to be checked for compliance with the excess burst rate. Frames that overflow the first bucket go into the second bucket. The buckets “leak” by a certain amount to allow for policing without disruption or delay of service.

- Standards-based management tools. Each FRSM supports SNMP, TFTP for configuration and statistics collection, and a command line interface. The Cisco WAN Manager application provides full graphical user interface support for connection management. The CiscoView application provides equipment management.
- MGX 8800-series network management functions, including image download, configuration upload, statistics, telnet, UI, SNMP, trap, and MIBs.
- OAM features: OAM F5 AIS, RDI, end-to-end or segment loopback as well as LMI and Enhanced LMI (ANNEX A, ANNEX D, Strata LMI).
- Hot swappable redundancy (see sections for individual FRSM card types).
- CLLM (router ForeSight and NNI ForeSight operation).
- Resource partitioning at the card level or port level.
- Bit error rate test (BERT) functions for all card types except the HSSI card types. For a description of BERT on the MGX-FRSM-2T3E3, see the forthcoming section “Bit Error Rate Testing on an Unchannelized T3 or E3 FRSM”. Running a BERT session on an MGX-FRSM-2CT3 or an eight-port FRSM requires a set of MGX-SRM-3T3s in the system. For a description of BERT on these cards, see the section titled “Bit Error Rate Testing Through an MGX-SRM-3T3.”

MGX-FRSM-2CT3 Features

The specific features are:

- Up to 1000 user-connections
- Two T3 lines
- Up to 256 logical ports
- Logical port speed from DS0 56 Kbps through DS1 1.536 Mbps
- Support for five Class of Service (CoS) queues (high priority, rt-VBR, nrt-VBR, ABR, UBR)
- 1:1 redundancy through Y-cable redundancy (no Service Resource Module required)

MGX-FRSM-2T3E3 Features

The specific features are:

- Up to 1000 user-connections
- Two T3 or E3 lines coinciding with two logical ports
- ADC Kentrox and Digital Link methods for supporting fractional T3 or E3 ports
- Maximum possible number of DLCIs per port by using the Q.922 two-octet header format
- Support for five Class of Service (CoS) queues (high priority, rt-VBR, nrt-VBR, ABR, UBR)
- 1:1 redundancy through Y-cable redundancy (no Service Resource Module required)
- Fractional T3 speeds available through either the Digital Link or ADC Kentrox method

MGX-FRSM-HS2/B Features

The specific features are:

- Up to 1000 user-connections
- Maximum 2 logical ports
- Two HSSI lines with configurable line speeds in multiples of 56 Kbps or 64 Kbps
- Selectable DTE or DCE mode for each port
- In DCE mode, per port clock speeds of NxT1 and NxE1 up to 52 Mbps
- Various DTE/DCE loopback operations
- Maximum possible number of DLCIs per port by using the Q.922 two-octet header format.
- 1:1 redundancy through a Y-cable

MGX-FRSM-HS1/B Features

The specific features are:

- Up to 512 data connections
- In addition to data connections, support for:
    — LMI according to ITU-T Q.333 Annex A and ANSI T1.617 Annex D
    — OAM messaging
- Total card throughput of 16 Mbps
- Maximum of 8 Mbps per line
- Choice of DTE or DCE mode for each line
- A maximum frame size of 4510 bytes
- One-to-one mapping between a logical port and a physical line
- Support for metallic (internal) loopback (ITU-T type 1)
- Support for ANSI/EIA/TIA-613-1993 and ANSI/EIA/TIA-612-1993

Eight-Port FRSM Features

The specific features are:

- Up to 1000 user-connections.
- Fractional FRSMs support a single 56-Kbps or multiple 64-Kbps user-ports (FR-UNI, FR-NNI, FUNI, and frame forwarding) per T1 or E1 line. Channelized FRSMs (AX-FRSM-8T1c and AX-FRSM-8E1c) support multiple 56 Kbps or N x 64 Kbps user-ports per line up to the physical line bandwidth limit.
- Bulk distribution for T1 only through the MGX-SRM-3T3. See the "Service Resource Module" section in this chapter.
- Redundancy support: the MGX-SRM-3T3 can provide 1:N redundancy for T1 or E1 operation. If the FRSM uses an SMB-8E1 back card, 1:1 redundancy is also available through Y-cabling.

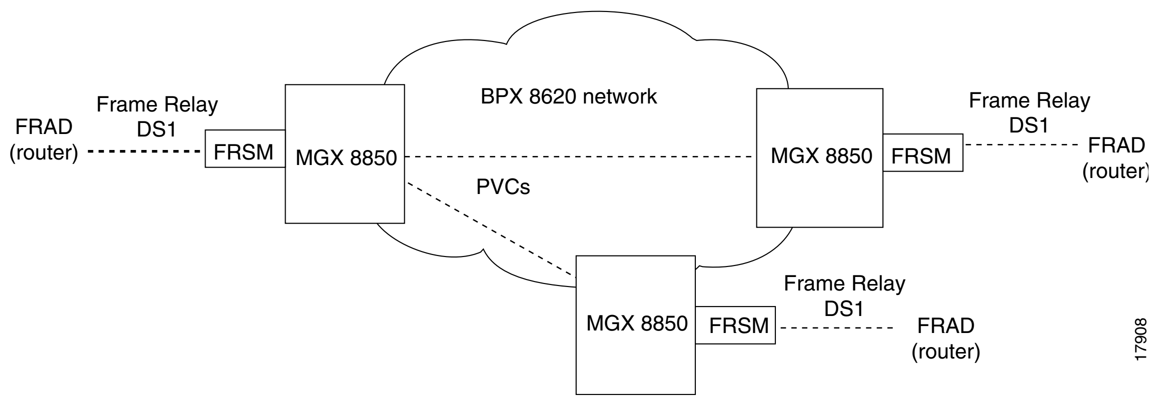
Description of Connection Types on the FRSM

The following sections describe NIW, SIW, FUNI, and frame forwarding. Topics include translation and congestion management.

Frame Relay-to-ATM Network Interworking

FR-ATM network interworking (NIW) supports a permanent virtual connection (PVC) between two Frame Relay users over a Cisco network or a multi-vendor network. The traffic crosses the network as ATM cells. To specify NIW for a connection, add the connection with a *channel type* of "network interworking." For an illustration of a BPX 8620 network with NIW connections, see Figure 6-2.

Figure 6-2 BPX 8620 Network with NIW Connections



In addition to frame-to-cell and DLCI-to-VPI/VCI conversion, the NIW feature maps cell loss priority (CLP) and congestion information from Frame Relay-to-ATM formats. Subsequent sections contain the details. You can modify the CLP and congestion indicators for individual connections.

Congestion Indication for NIW Connections

You can modify the CLP and congestion indicators for individual connections. On the CLI., use the **cnfchanmap** command. In the Frame Relay-to-ATM direction, you can configure each Frame Relay-ATM NIW connection for one of the following CLP-to-DE mapping schemes:

- DE bit in the Frame Relay frame is mapped to the CLP bit of every ATM cell generated by the segmentation process.
- CLP is always 0.
- CLP is always 1.

In the ATM-to-Frame Relay direction, you can configure each Frame Relay/ATM NIW connection for one of the following CLP-to-DE mapping schemes:

- If at least one ATM cell from a frame has CLP=1, the DE field of the Frame Relay frame is set.
- No mapping from CLP to DE.

Congestion on the Frame Relay/ATM network interworking connection is flagged by the EFCI bit. The EFCI setting depends on the direction of the traffic. In the Frame Relay-to-ATM direction, EFCI is always set to 0. In the ATM-to-Frame Relay direction, the FECN bit of the Frame Relay frame is set if the EFCI field in the last received ATM cell of a segmented frame is set.

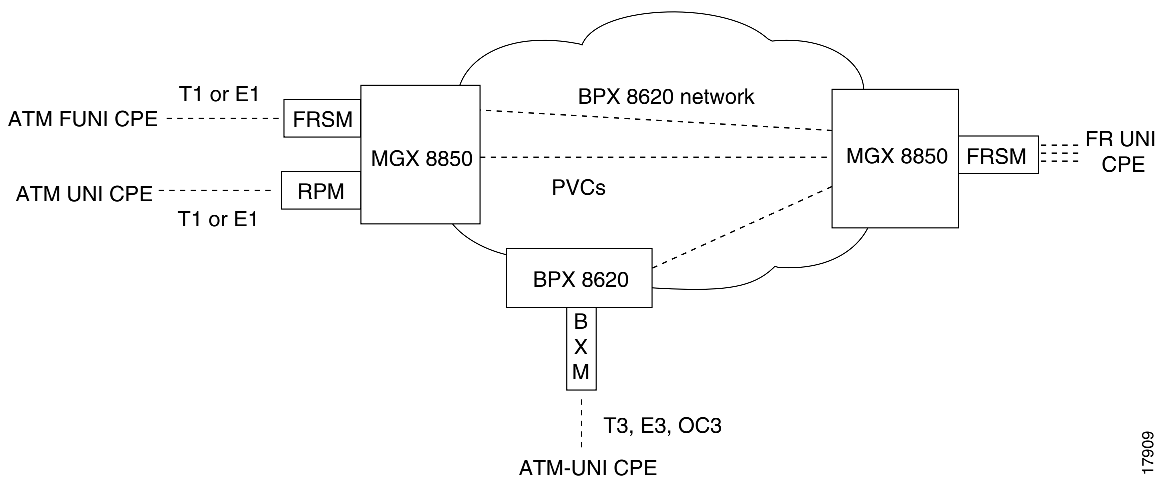
PVC Status Management

The management of ATM layer and FR PVC status management can operate independently. The PVC status from the ATM layer is used when determining the status of the FR PVC. However, no direct actions of mapping LMI A bit to OAM AIS is performed.

Frame Relay-to-ATM Service Interworking

By specifying a service interworking (SIW) channel type when you add a Frame Relay PVC to an FRSM, all data is subject to SIW translation and mapping in both the Frame Relay-to-ATM and ATM-to-Frame Relay directions. A BPX 8620 network with SIW connections appears in Figure 6-3.

Figure 6-3 BPX 8600-Series Network with SIW Connections



In Figure 6-3, an MGX 8850 node on the right has three Frame Relay SIW connections terminating on an FRSM. Three far-end terminations for these connections appear in other parts of Figure 6-3:

- ATM FUNI (framed UNI) port on an FRSM
- ATM UNI port on an RPM
- ATM UNI port on a BPX 8600-series BXM card

In addition to frame-to-cell and DLCI-to-VPI/VCI conversion, SIW maps cell loss priority and congestion data between the Frame Relay and ATM formats and is FRF.8-compliant. It provides full support for routed and bridged PDUs, transparent and translation modes, and VP translation.

Cell Loss Priority

In addition to frame-to-cell and DLCI-to-VPI/VCI conversion, the SIW feature maps cell loss priority (CLP) and congestion information from Frame Relay-to-ATM formats.

You can modify the CLP and congestion indicators for individual connections. On the CLI., use the **cnfchanmap** command. In the Frame Relay-to-ATM direction, you can specify one of the following discard eligibility (DE)-to-cell loss priority (CLP) schemes for an individual SIW connection:

- DE bit in the Frame Relay frame is mapped to the CLP bit of every ATM cell generated by frame segmentation.
- CLP is always 0.

- CLP is always 1.

In the ATM-to-Frame Relay direction, you can specify a CLP-to-DE mapping scheme for an individual connection:

- If one or more ATM cells belonging to a frame has CLP=1, the DE field of the Frame Relay frame is set.
- DE is always 0.
- DE is always 1.

Congestion Indication

This section describes congestion indictors. You can modify the CLP and congestion indicators for individual connections. On the CLI, use the **cnfchanmap** command. In the Frame Relay-to-ATM direction, you can configure a Frame Relay-to-ATM SIW connection for one of the following Forward Explicit Congestion Notification (FECN)-to-Explicit Forward Congestion Indicator (EFCI) schemes:

- FECN bit in the Frame Relay frame is mapped to the EFCI bit of every ATM cell generated by the segmentation process of the frame.
- EFCI is always 0.
- EFCI is always 1.

In the ATM-to-Frame Relay direction, service interworking connections use the following EFCI to FECN/BECN mapping schemes:

- If the EFCI bit in the last ATM cell of a segmented frame received is set to 1, the FECN of the Frame Relay frame is set to 1.
- BECN is always set to 0.

Command and Response Mapping

The FRSM provides command and response mapping in both directions:

- In the Frame Relay-to-ATM direction, the FRSM maps the C/R bit of the received Frame Relay frame to the CPCS-UU least significant bit of the AAL5 CPCS PDU.
- In the ATM-to-Frame Relay direction, the FRSM maps the least significant bit of the CPCS-UU to the C/R bit of the Frame Relay frame.

Translation and Transparent Modes

Each service interworking (SIW) connection can exist in either *translation* or *transparent* mode. In translation mode, the FRSM translates protocols between the FR NLPID encapsulation (RFC 1490) and the ATM LCC encapsulation (RFC 1483). In transparent mode, the FRSM does not translate. Translation mode support includes address resolution by transforming address resolution protocol (ARP, RFC 826) and inverse ARP (inARP, RFC 1293) between the Frame Relay and ATM formats.

Frame Forwarding

You can configure an individual port for frame forwarding. Frame forwarding is the same as standard Frame Relay except that the FRSM:

- Does not interpret the two-byte Q.922 header.
- Maps all received frames to a specific connection if it exists, otherwise it discards the frames.
- Does not map between DE and CLP or between FECN and EFI.
- Does not support statistics for “Illegal header count” or “Invalid DLCI.”
- Does generate statistics for “Discarded frame count due to no connection.”

ATM/Frame-to-User Network Interface

All FRSMs support the ATM Frame User-to-Network Interface (FUNI). When a frame arrives from the FUNI interface, the FRSM removes the 2-byte FUNI header and segments the frame into ATM cells by using AAL5. In the reverse direction, the FRSM assembles ATM cells from the network into a frame by using AAL5, adds a FUNI header to the frame, and sends it to the FUNI port.

Loss Priority Indication

The FRSM maps the loss priority indication for both directions:

- In the FUNI to ATM direction, the FRSM maps the CLP bit in the FUNI header to the CLP bit of every ATM cell that it generates for the FUNI frame.
- In the ATM-to-FUNI direction, the FRSM always sets the CLP bit in the FUNI header to 0.

Congestion Indication

The FRSM maps congestion indication in both directions:

- In the FUNI-to-ATM direction, it sets EFCI to 0 for every ATM cell it generates by segmentation.
- In the ATM-to-FUNI direction, it sets the CN bit in the FUNI header to 1 if the EFCI field in the last ATM cell of a received, segmented frame is 1. The two reserve bits (the same positions as C/R and BECN in Frame Relay header) are always 0.

Configuring Frame Relay Service

This section first describes how to configure the FRSM card, lines, and ports, then describes how to add connections. The descriptions are for the CLI execution of the tasks. You can also configure the FRSM card, lines, and ports by using the CiscoView application. Refer to the CiscoView documentation for the directions. Also, the easiest way to add connections is by using the Cisco WAN Manager application. For full details of how to set up a connection through the WAN Manager GUI, refer to the *Cisco WAN Manager Operations* manual.

Configuring the FRSM Cards, Lines, and Ports

This section describes how to configure card-level parameters—including Y-cable redundancy where applicable, physical lines, and logical ports on the FRSM-series cards.

Step 1 If necessary, modify the resource partitioning for the whole card by executing the **cnfcdrscprtn** command. You can view resource partitioning through **dspcdrscprtn**.

cnfcdrscprtn <*number_PAR_conns* | *number_PNNI_conns* | *number_TAG_conns*>

number_PAR_conns is the number of connections in the range 0–1000 available to the PAR controller.

number_PNNI_conns is the number of connections in the range 0–1000 available to a PNNI controller.

number_TAG_conns is the number of connections in the range 0–1000 available to the Tag controller.

For example, you could reserve 300 connections for each controller on the FRSM with:

cnfcdrscprtn 300 300 300

Step 2 If the physical line is not yet active, use the **addln** command to activate it. The only argument **addln** takes is the line number.

Step 3 If necessary, modify a line on the MGX-FRSM-2CT3, MGX-FRSM-HS2/B, MGX-FRSM-HD1/B, AX-FRSM-8T1 or AX-FRSM-8E1 by using **cnfln**.

To change line parameters on an MGX-FRSM-2CT3, MGX-FRSM-2T3E3, or MGX-FRSM-2E3, use **cnfds3ln**. Note that both **cnfln** and **cnfds3ln** apply to the MGX-FRSM-2CT3 but affect different aspects of it.

For the syntax of the line modification commands on all cards except the MGX-FRSM-HS1/B, refer to the *Cisco MGX 8850 Wide Area Edge Switch Command Reference*.

The syntax for the MGX-FRSM-HS1/B is;

cnfln <*line_num*> <*line_type*> <*line_rate*>

- *line_num* has the range 1–4,
- *line_num* is a number that specifies the mode and must accord with the 12IN1 cable connected to the port: 1=DTE. 2=DCE. 3=DTE_ST (V.35 only)
- is a number in the range 1–50 that corresponds to a specific rate for the line. The range for line rates is 48 Kbps–52 Mbps. In Table 6-1, the number for *line_rate* corresponds to a number of bits per second.

Table 6-2 Supported Lines rates on the MGX-FRSM-HS1/B

1–50 Correspond to Line Rates in Kbps.				
1=48000	2=56000	3=64000	4=112000	5=128000
6=168000	7=192000	8=224000	9=256000	10=280000
11=320000	12=336000	13=384000	14=392000	15=448000
16=512000	17=768000	18=1024000	19=1536000	20=1544000
21=1792000	22=1920000	23=1984000	24=2048000	25=3097000
26=3157000	27=4096000	28=4645000	29=4736000	30=6195000
31=6315000	32=7744000	33=7899000	34=8192000	35=9289000
36=9472000	37=10240000	38=10890000	39=11059000	40=12390000
41=12629000	42=13897000	43=14222000	44=14336000	45=15488000
46=15799000	47=16384000	48=20025000	49=2498600	50=52000000

The possible errors for **cnfln** are:

- One or more parameters are invalid.
- Line does not exist (has not been added).
- Loopback or BERT is on.
- An active port already exists on this line.

Step 4 If the logical port does not exist or is not the appropriate type (Frame Relay, FUNI, or frame forwarding), execute **addport** to create the appropriate type of port. If the logical port already exists and needs no modification (**cnfport**), you can add connections by performing the tasks in "Adding a Frame Relay Connection." The parameters for **addport** depend on the type of FRSM:

For MGX-FRSM-2T3, MGX-FRSM-2E3, or MGX-FRSM-HS2/B:

addport <*port_num*> <*line_num*> <*port_type*>

- *port_num* is the logical port number in the range 1–2. The mapping between a logical port and a line is one-to-one for these cards. Note that the maximum committed information rate (CIR) on each line for these cards is 0-44210000 bps for MGX-FRSM-2T3, 0-34010000 bps for MGX-FRSM-2E3, and 0-51840000 bps for MGX-FRSM-HS2. Specify CIR with **addcon** (or **addchan** if necessary).
- *line_num* is the physical line number in the range 1–2.
- *port_type* is a number representing the mode of operation for the logical port: 1 for Frame Relay; 2 for FUNI mode-1a; or 3 for frame forwarding.

For an MGX-FRSM-2CT3:

addport <*port_num*> <*line_num*> <*ds0_speed*> <*begin_slot*> <*num_slot*> <*port_type*>

- *port_num* is the logical port number in the range 1–256. When you subsequently add a connection through the preferred command **addcon** or the **addchan** command (which requires NSAP format), you must indicate a logical port by using this singular *port_num* regardless of the number of DS0s. (You can add 1–24 DS0s to a single *port_num* through the other **addport** parameters.)

- *line_num* is the DS1 number in the range 1–56 to which you assign the DS0 when both lines are active. If you activate only one line, the range is 1–28. You can assign up to 24 contiguous DS0s to one DS1. Each physical line supports up to 28 DS1s. The number of DS0s cannot span more than DS1.
- *ds0_speed* is a number representing the DS0 speed: 1 for 56 Kbps or 2 for 64 Kbps.
- *begin_slot* is the beginning DS0 timeslot in 1 base. For example, on port number 50, you could make *begin_slot*=9 then specify *num_slot* to be in the range 1–16.
- *num_slot* is the number of DS0s in the associated DS1. Note that the number of DS0s cannot be such that the logical port spans more than DS1.
- *port_type* is a number representing the mode of operation for the logical port: 1 for Frame Relay; 2 for FUNI mode-1a; and 3 for frame forwarding.

For MGX-FRSM-HS1/B

addport <*port_num*> <*port_type*>

- *port_num* is the port number in the range 1–4.
- *port_type* is a number representing the type of frame interface technology for the logical port: 1 for Frame Relay; 2 for FUNI mode-1a; or 3 for frame forwarding.

For AX-FRSM-8T1 and AX-FRSM-8E1:

addport <*port_num*> <*line_num*> <*ds0_speed*> <*begin_slot*> <*num_slot*> <*port_type*>

- *port_num* is the logical port number in the range of either 1–192 for T1 or 1–248 for E1. When you subsequently add a connection through the preferred command **addcon** or the **addchan** command (which requires NSAP format), you must indicate a logical port by using this singular *port_num* regardless of the number of DS0s. (You can add 1–24 DS0s to a single line through the other **addport** parameters.)
- *line_num* is the physical line number in the range 1–8.
- *ds0_speed* is a number representing the DS0 speed: 1 for 56 Kbps or 2 for 64 Kbps.
- *begin_slot* is the beginning DS0 timeslot in 1 base. For example, on port number 50, you could make *begin_slot*=9 then specify *num_slot* to be in the range 1–16.*begin_slot* is the beginning timeslot in 1 base.
- *num_slot* is the consecutive DS0s that each connection on *port_num* has.
- *port_type* is a number representing the mode of operation for the logical port: 1 for Frame Relay; 2 for FUNI mode-1a; and 3 for frame forwarding.

Step 5 Modify as needed the signaling on a port by executing cnfport.

cnfport <*port_num*> <*lmi_sig*> <*asyn*> **<***elmi***>** <*T391*> <*T392*> <*N391*> <*N392*> <*N393*>

- *port_num* is the logical port number with a range that depends on the type of FRSM:
  - For the MGX-FRSM-2CT3, 1–56
  - For a channelized AX-FRSM-8T1, 1–192
  - For a channelized AX-FRSM-8E1, 1–248
  - For the unchannelized cards, the range equals the number of lines.

- *lmi_sig* specifies the LMI signaling. 1=Other, 2=None, 3=StrataLMI, 4=AnnexAUNI, 5=AnnexDUNI, 6=AnnexANNI, 7=AnnexDNNI LMI signalling, N=none, S=StrataLMI, and au=AnnexAUNI.
- *asyn* enables asynchronous updates: (y)es or (n)o
- *elmi* enables Enhanced LMI: (N or n) disable (Y or y) enable
- *T391* sets the T391 timer. The range is 5–30 seconds. It sets the interval in seconds for NNI status polling. The default is 10.
- *T392* sets the T392 timer. The range is 5–30 seconds. It sets the interval in seconds for UNI status polling. The default is 15.
- *N391* sets the N391 counter–the number of UNI/NNI polling cycles. The range is 1–255. The default is 6.
- *N392* sets the N392 counter–the threshold for UNI/NNI *errors*. The range is 1–10. The default is 3.
- *N393* sets the N393 counter–the UNI/NNI threshold for *monitored events*. The range is 1–10 and must be greater than the value of *N392.* The default is 4.

Step 6 Configure resources for the port as needed by executing **cnfportrscprtn**. To see the partitioning, use **dspportrscprtn**. The description has a high and low-bandwidth version:

cnfportrscprtn <*port_num*> <*controller*> <*percent BW*> <*low DLCI*> <*high DLCI*> <*max LCN*>

For FRSM-VHS cards:

- *port_num* is the port number in the range 1–2 for MGX-FRSM-2T3E3 and MGX-FRSM-HS2 or 1–256 for MGX-FRSM-2CT3.
- *controller* is a number representing the controller: 1=PAR, 2=PNNI, and 3=Tag.
- *percent BW* is the percentage of the bandwidth in the range 0–100 and applies to both egress and ingress.
- *low DLCI* is in the range 0–1023.
- *high DLCI* is in the range 0–1023.
- *max LCN* is the maximum number of logical connections available to the controller on this port. The ranges are 1–4000 for MGX-FRSM-2CT3 and 1–2000 for MGX-FRSM-2T3E3 and MGX-FRSM-HS2.

For AX-FRSM-8T1 or AX-FRSM-8E1:

- *port_num* is the logical port number in the range 1–192 for T1 or 1–248 for E1.
- *controller-name* is PAR, PNNI, or TAG.
- *percent BW* is the percentage of the bandwidth in the range 0–100 and applies to both egress and ingress.
- *low DLCI* is in the range 0–1023.
- *high DLCI* is in the range 0–1023.
- *max LCN* is the maximum number of logical connections available to the controller on this port. The range is 1–1000.

Note The following step applies to Y-cable redundancy for the MGX-FRSM-2T3E3. For 1:*N* redundancy on the eight-port FRSMs, refer to "Redundancy Support by the MGX-SRM-3T3/B."

Step 7 Optionally configure Y-cable redundancy if you have connected the lines of adjacent MGX-FRSM-2T3 or MGX-FRSM-2E3 cards through a Y-cable. The applicable commands are **addred**, **dspred**, and **delred**. These commands run on the PXM rather than the service module, so you must change to the PXM CLI to execute them:

addred <*redPrimarySlotNum*> <*redSecondarySlotNum*> <*redType*>

- *redPrimarySlotNum* is the slot number of the primary card. The possible numbers are 1–6, 9–14, 17–22, and 25–30.
- *redSecondarySlotNum* is the slot number of the primary card. The possible numbers are 1–6, 9–14, 17–22, and 25–30.
- *redType* is the type of redundancy. Enter a 1 for 1:1 Y-cable redundancy.

Adding a Frame Relay Connection

This section describes how to add a Frame Relay connection according to the rules for adding a standard connection or a management connection in the form of either a DAX con or a three-segment connection. See "Rules for Adding Connections" earlier in this chapter.

Step 1 Add a connection by using **addcon**. If the application requires the NSAP form for the endpoint, use **addchan** as described in the command reference.

The system automatically assigns the next available *channel number*, so the **addcon** command does not require it. However, some related commands require a channel number. To see the channel number after you add a connection, use **dspcons**.

On the FRSM-VHS cards (2CT3, 2T3E3, or HS2):

addcon <*port*> <*DLCI*> <*cir*> <*chan_type*> <*egress_service_type*> [*CAC*] <*controller_type*> <*mastership*> [*connID*] <*controllerID*>

- *port* is the logical port number on the MGX-FRSM-2CT3 in the range 1–256. On the MGX-FRSM-2T3E3 and MGX-FRSM-HS2, the range is 1–2. (See **addport** step if necessary.)
- *DLCI* is the DLCI number in the range 0–1023 (2CT3/2T3/2E3/HS2).
- *cir* is the committed information rate in one of the following ranges:
  for 2CT3, 0–1536000 bps; for 2T3, 0–44210000 bps; 2E3, 0–34010000 bps; and
  for HS2, 0–51840000 bps.
- *chan_type* specifies the type of connection: 1=NIW, 2=SIW-transparent mode; 3=SIW with translation; 4=FUNI, and 5=frame forwarding.
- *egress_service_type* is a number that specifies the type of queue on the egress: 1=high priority; 2=real-time VBR, 3=nonreal-time VBR; 4=ABR; and 5=UBR.
- *CAC* optionally enables connection admission control; 1=enable. 2=disable (default). With CAC enabled, the system adds the resource consumption represented by adding the connection to the total resources consumed on a logical port.
- *controller_type* is the controller type for signaling connections: 1 (the default) specifies a PVC and applies to PAR. 2 specifies a SPVC and applies to PNNI.

- *mastership* indicates if this end of the connection is master or slave: 1=master, 2=slave.
- *connID* is the connection identifier at the remote end. It appears in the syntax as an optional parameter because it is mandatory only when you add the connection at the master end. See "Rules for Adding Connections" at the beginning of this chapter. *connID* can have one the following formats according to the slave endpoint:

  Nodename.SlotNo.PortNo.DLCI

  Nodename.SlotNo.PortNo.ControllerId.DLCI

  Nodename.SlotNo.PortNo.VPI.VCI for ATM endpoint
- *controllerID* is a number indicating the type of network control application: 1=PAR, 2=PNNI, 3=MPLS

For AX-FRSM-8T1 and AX-FRSM-8E1:

addcon *<port>* *<DLCI>* *<cir>* *<chan_type>* [*CAC*] *<controller_type>* *<mastership>* *<connID>* *<controllerID>*

- *port* is the logical port number in the range 1–192 for T1 or 1–248 for E1. (See **addport** step if necessary.)
- *DLCI* is the DLCI number in the range 0–1023.
- *cir* is the committed information rate in one of the following ranges: for T1, 0–1536000 bps for T1; for E1, 0–2048000 bps.
- *chan_type* specifies the type of connection: 1=NIW, 2=SIW-transparent mode; 3=SIW with translation; 4=FUNI, and 5=frame forwarding.
- *CAC* optionally enables connection admission control: 1=enable. 2=disable (default).
- *controller_type* is the controller type for signaling: 1=PVC (PAR), the default, 2=SPVC (PNNI).
- *mastership* indicates if this end of the connection is master or slave: 1=master, 2=slave.
- *connID* is the connection identifier at the remote end and can have one the following formats according to the type of card at the slave endpoint:

  NodeName.SlotNo.PortNo.DLCI

  NodeName.SlotNo.PortNo.ControllerId.DLCI

  NodeName.SlotNo.PortNo.VPI.VCI for ATM endpoint

  If the remote end is a PXM, the port number can be in the range 1–32 for user connections or 34 for inband management connections (stand-alone node only).
- *controllerID* is a number indicating the type of network control application: 1=PAR, 2=PNNI, 3=TAG.

For MGX-FRSM-HS1/B:

addcon *<port_number>* *<DLCI>* *<CIR>* *<chan_type>* *<CAC>* *<Controller_type>* *<mastership>* *<connID>*

- *port_number* is the logical port in the range 1–4.
- *DLCI* is the DLCI in the range 0–1023.

- *CIR* specifies the committed information rate. The range is 0–10000000 bps (although the V.35 version supports a maximum of 8 Mbps sustained).
- *chan_type* is a number that identifies the channel type: 1=NIW. 2=transparent SIW. 3=SIW with translation. 4=FUNI. 5=frame forwarding.
- *CAC* enables connection admission control.
- *Controller_type* identifies the network control application. 1=PAR. 3=PNNI.
- specifies the mastership status of this end of the connection. 1=,aster. 2=slave.
- *mastership* indicates the mastership status for this end of the connection. 1=master. 2=slave.
- *connID* is the "remote" connection identifier from the slave end if you need to enter it at the master end. See "Rules for Adding Connections" for an explanation. The possible formats are:
  - *NodeName.SlotNo.PortNo.DlCI*
  - *NodeName.SlotNo.PortNo.ControllerId.DlCI* for Frame Relay end point
  - *NodeName.SlotNo.PortNo.VPI.VCI* for ATM end point.

  Where *ControllerId* can be 1(PAR),2(PNNI),3(TAG)

Step 2 Modify a connection as needed by executing **cnfcon**. See the command line Help or the command reference for the parameters for individual card types.

Step 3 If necessary, modify the CLP and congestion indicator fields by using **cnfchanmap**:

cnfchanmap <*chan_num*> <*chanType*> <*FECN/EFCI*> <*DE to CLP*> <*CLP to DE*>

chan_num	is the channel (connection) number. The ranges are: 2CT3, 16–4015 2T3, 2E3, HSSI, 16–2015 T1, E1, 16–1015
chanType	is a number in the range 1–5 indicating the service type for the connection. 1=NIW 2=SIW in transparent mode 3=SIW in translation mode 4=FUNI 5=frame forwarding
FECN/EFCI	is a number in the range 1–2 that specifies the mapping between FECN and EFCI fields. 1=map EFCI (SIW only) 2=set EFCI to 0
DE to CLP	is a number in the range 1–3 that specifies the DE to CLP mapping. 1=map DE to CLP 2=set CLP to 0 3=set CLP to 1

CLP to DE is a number in the range 1–4 that specifies the CLP to DE mapping.

1=map CLP to DE
2=set DE to 0
3=set DE to 1
4=ignore CLP (NIW only)

Establishing the BPX 8600-to-BPX 8600-Series Segment

For a three-segment connection, establish a BPX 8600-to-BPX 8600-series (middle) segment. Execute **addcon** at *one* of the BPX 8600-series nodes, as follows.

- For slot and port number, specify slot and port of the BXM connected to MGX 8850 node.
- For VPI and VCI, specify the VPI and VCI at the endpoint on the PXM.
- For Nodename, use the name of the BPX 8600-series switch at the far end of the connection.
- For Remote Channel, specify the slot and port number of the BXM port attached to the MGX 8850 node at the far end. Specify the VPI as the slot number of the remote MGX 8850 FRSM connected to the BPX 8600-series switch, and specify VCI as the LCN of the Frame Relay connection at the remote MGX 8850 node.
- Specify the type of connection. Enter ATFST if the ForeSight feature is operating and ATFR if this feature is not operating.

Specify the other **addcon** bandwidth parameters such as MCR, PCR, %Util, and so on.

- Minimum Cell Rate (MCR) is only used with the ForeSight feature (ATFST connections).
- MCR and Peak Cell Rated (PCR) should be specified according to the following formulae.
- MCR=CIR *3/800 cells per second.
- PCR=AR * 3/800 cells per second but less than or equal to 6000.
  AR=Frame Relay port speed in bps. For example,

For example: AR equals 64K, PCR=237, or
AR speed equals 256K, PCR=950, or
AR speed equals 1536K, PCR=5703

The preceding MCR and PCR formulae are predicated on a relatively small frame size of 100 octets, and even smaller frame sizes can result in worse-case scenarios. For example:

For a frame size of 64 octects the PCR formula becomes: PCR=AR * 2/512 cells per sec

For a frame size of 43 octects the PCR formula becomes: PCR=AR * 2/344 cells per sec

% Util should be set to the same value as that used for the Frame Relay segments of the connection.

Test Commands for the FRSMs

Use the display commands (**dsp**...) for checking the state of cards, lines, ports, queues, and connections. The following commands are available for testing the FRSMs (see the *Cisco MGX 8850 Wide Area Edge Switch Command Reference* for descriptions):

- **addlnloop**, **cnflnloop**, and **dellnloop** are line-level, diagnostic commands that require the *service level* user privilege.

- **addchanloop** and **delchanloop** are standard user commands for looping on a channel.
- **tstcon** checks the integrity of a connection.
- **tstdelay** measures the round trip delay on a connection.

Bit Error Rate Testing on an Unchannelized T3 or E3 FRSM

The MGX 8850 switch can perform a bit error rate test (BERT) on one active line at a time on the MGX-FRSM-2T3 or MGX-FRSM-2E3. This type of testing disrupts service because it requires the tested path to be in loopback mode. You can configure a BERT session and perform related tasks through the CiscoView application or the CLI.

The MGX 8850 bus structure supports one BERT session per upper or lower bay of the card cage, so the switch can run a maximum of two sessions at once. When you specify the target slot through the CiscoView application or the **acqdsx3bert** command on the CLI, the system determines if a BERT configuration already exists in the bay that has the specified slot. If no BERT configuration exists in the bay, the display presents a menu for the BERT parameters.

The CLI commands (whose functions correspond to CiscoView selections) are:

- **acqdsx3bert** to determine if other BERT sessions exist in the bay
- **cnfdsx3bert** to specify a pattern for the BERT test
- **startdsx3bert** to start a BERT test (after resetting BERT counters)
- **moddsx3bert** to inject multi-rate errors into the BERT bit stream
- **dspdsx3bert** to display the parameters and results of the current test
- **deldsx3bert** to end the current test (and retain the values in the BERT counters)

See the *Cisco MGX 8850 Wide Area Edge Switch Command Reference* for command details.

Note When a BERT session begins, all the connections on the line go into alarm and return to normal when you end the test. Consequently, the test may result in a large number of traps and other types of traffic (such as AIS).

Circuit Emulation Service Module for T3 and E3

The main function of the Circuit Emulation Service Module (CESM) is to provide a constant bit rate (CBR) service. The CESM converts data streams into CBR AAL1 cells according to the CES-IS specifications of the ATM Forum for *unstructured* transport across an ATM network. Unstructured transport means the CESM does not interpret or modify framing bits, so a high-speed CESM creates a single data pipe The most common application is legacy support for digitized voice from a PBX or video from a codec. Using circuit emulation, a company can expand its data communication network without specific voice or video cards to meet its voice or teleconferencing requirements.

The higher speed CESM uses a T3 or E3 line. The card set consists of an MGX-CESM-T3 or MGX-CESM-E3 front card and either a BNC-2T3 or BNC-2E3 back card. In this CESM application, only one line on the two-port back card is operational. Furthermore, it supports one logical port and one logical connection (as a data pipe) on the line and runs at the full T3 or E3 rate. Although the typical connection setup is the three-segment connection across an ATM network, the CESM can support a DAX connection. Up to 26 CESM card sets can operate in an MGX 8850 node.

Features

The MGX-CESM-T3 or MGX-CESM-E3 provide the following:

- Unstructured data transfer at 44.736 Mbps (1189980 cells per second) for T3 or 34.368 Mbps (91405 cells per second) for E3
- Synchronous timing by either a local clock sourced on the PXM or loop timing (transmit clock derived from receive clock on the line)
- 1:1 redundancy is through a Y-cable
- Programmable egress buffer size (in the form of cell delay variation)
- Programmable cell delay variation tolerance (CDVT)
- Per VC queuing for the transmit and receive directions
- An idle code suppression option
- Bit count integrity when a lost AAL1 cell condition arises
- Alarm state definitions per G.704
- Trunk conditioning by way of framed AIS for T3 and unframed, alternating 1s and 0s for E3
- On-board bit error rate testing (BERT)

Cell Delay Treatment

You can configure a tolerable variation in the cell arrival time (CDVT) for the receive buffer. After an underrun, the receiver places the contents of the first cell to arrive in a receive buffer then plays it out at least one CDVT value later. The maximum cell delay and CDVT (or jitter) are:

- For T3
  - Cell delay of 4 msec
  - CDVT of 1.5 msec in increments of 125 microseconds
- For E3
  - Cell delay of 2.9 msec
  - CDVT of 2 msec in increments of 125 microseconds

Error and Alarm Response

When it detects a loss of signal (LOS) alarm, the CESM notifies the connected CPE in the upstream direction after an integration period. The CESM continues to emit cells at the nominal rate but sets the ATM cell payload with an appropriate data pattern as specified by the ATM Forum CES V2.0 specification. Also, an OAM cell with RDI code goes to the far end to indicate out-of-service. The significance of the different types of alarms appears in Table 6-3.

Table 6-3 CESM Errors and Alarms

Error	Alarm Type	Down stream	Up Stream	Comments
Link Failure (RX)	Blue (LOS)	AIS—OAM cells	none	Data cells According to ATM-Forum CES-IS V 2.0
Receive RAI	Yellow	None	None	
Receive LOF		n/a	n/a	Not applicable.
Receive AIS	Blue (AIS)	AIS (link)	FERF OAM cells	AIS—done over the T3/E3 link by sending the AIS data over the T3/E3 link.

Configuring Service on a T3 or E3 CESM

This section first describes the steps for configuring the card, line, and port-level parameters for an MGX-CESM-T3 and MGX-CESM-E. It then describes how to add a connection. If necessary, refer to the section titled “Tasks for Configuring Cards and Services” for background information on these types of tasks. Use either the CLI or the CiscoView application to set up the card and line parameters. Use either the CLI or the Cisco WAN Manager application to add connections. The fundamental tasks and applicable CLI commands appear in the following list. For a complete list of CLI commands that apply to the CESM cards, use the **Help** command on the CLI of the card or refer to the tables at the front of the *Cisco MGX 8850 Wide Area Edge Switch Command Reference*.

- Optionally configure Y-cable redundancy at the card level (**addred** on the CLI).
- Optionally modify resource partitioning at the card level (**cnfcdrscprtn**)
- Activate a physical line (**addln** on the CLI) and optionally configure the line (**cnfln**) for line coding, line length, and clock source.
- Activate the functioning of the logical port on a physical line (**addport**)
- Optionally modify resource partitioning at the port level (**cnfportrscprtn**)
- Add the connections by using **addcon** (or **addchan** if NSAP addressing is necessary)
- Configure the connection for CDVT, cell loss integration period, and egress buffer size by using **cnfcon** (or **cnfchan** if NSAP addressing is necessary).

Configuring the Card, Lines, and Ports

This section describes how to configure parameters for the card, line, and port through the CLI. If you use the CiscoView application, refer to CiscoView documentation. The command sequence is:

Step 1 **addln** <*line number*>

where *line number* is 1. You can modify line characteristics with **cnfln**.

Step 2 Optionally execute **cnfln** to modify line characteristics:

cnfln <*line_num*> <*line_code*> <*line_len*> <*clk_src*>

- *line_num* is 1.
- *line_code* is a number to specify line coding: 1 for B3ZS (T3), and 2 for HDB3 (E3)
- *line_len* is a number that specifies the line length: 1 for up to 225 feet, and 2 for more than 225 feet
- *clk_src* is a number that specifies the clock source: 1 for local clock sourced on the PXM, and 2 for looped clock

Step 3 Use **dspln** or **dsplns** to check the line. For **dspln**, the valid line number is 1.

Step 4 Create a logical port with **addport**:

addport <*port_num*> <*line_num*>

- *port_num* is the logical port number and is always 1
- *line_num* is the number of the physical line and is always 1.

Step 5 Configure resources at the port level as needed by executing **cnfportrscprtn**:

cnfportrscprtn <*port_num*> <*controller_name*>

- *port_num* is the logical port number and is always 1.
- *controller_name* is the name of the network control application. Enter one of the following strings: PAR, PNNI, or MPLS.

Step 6 Optionally configure Y-cable redundancy if you have connected the lines of adjacent CESMs through a Y-cable. The applicable commands are **addred**, **dspred**, and **delred**. These commands run on the PXM rather than the service module, so you must change to the PXM CLI to execute them:

addred <*redPrimarySlotNum*> <*redSecondarySlotNum*> <*redType*>

- *redPrimarySlotNum* is the slot number of the primary card. The possible numbers are 1–6, 9–14, 17–22, and 25–30.
- *redSecondarySlotNum* is the slot number of the primary card. The possible numbers are 1–6, 9–14, 17–22, and 25–30.
- *redType* is the type of redundancy. Enter a 1 for 1:1 Y-cable redundancy.

Adding and Modifying Connections

Use either the Cisco WAN Manager application or the CLI to add or modify connections. If you use the WAN Manager application, refer to the *Cisco WAN Manager Operations Guide*.

This section describes how to add a connection to a PXM in a stand-alone node according to the rules for a standard connection or a management connection in the form of either a three-segment connection or a DAX con. See "Rules for Adding Connections" earlier in this chapter. The preferred

command is **addcon**. If the application requires NSAP addressing, use **addchan** to add the connection and **cnfchan** if you need to modify it. Refer to the command reference for the syntax. On the CESM CLI:

Step 1 Add a connection by executing **addcon**. (Alternatively, you can use **addchan** if your application requires the NSAP format of endpoint specification.) Execute **addcon** at both ends of the connection—unless the remote endpoint is on port 34 of a PXM (see the note at the end of this step).

The syntax for **addcon** is:

addcon <*port_num*> [*mastership* [*remoteConnId*]]

- *port_num* is the logical port number and is always 1.
- *mastership* indicates whether this endpoint is the master or slave. 1=master. 2=slave (default).
- *remoteConnId* is the identification for the connection at the slave end. The format is *nodename.slot_number.port_number.vpi.vci.* For the MGX-CESM-T3 and MGX-CESM-E3, the vpi and vci are typically 0 or 1.

Note For the *channel number*, the system always returns the number 32 for the high speed CESM. If you execute **dspchan**, use the channel number 32 to see details about the channel (or **dspchans**—and no arguments—to see high level details about the channel). In contrast, the **dspcon** command takes the *port number* 1 to identify the connection even though it shows the same information as **dspchan**.

Step 2 Optionally, you can use **cnfcon** to modify the connection.

cnfcon <*port_num*> <*CDVT*> <*CellLossIntegPeriod*> <*bufsize*>

- *port_num* is the port number and is always 1.
- *CDVT* is a tolerable variation for the arrival time of cells. For T3, the range is 125–1447 micro seconds in 125-microsecond increments. For E3, the range is 125–1884 micro seconds in 125-microsecond increments.
- *CellLossIntegrationPeriod* is the amount of time a connection can be in an error condition before an alarm is declared. The range is 1000–65535 milli seconds.
- *bufsize* is the egress buffer size in bytes. You can let the CESM compute the size by entering 0 for *bufsize* or enter the number of bytes up to a maximum of 16224.

Step 3 Optionally, you can use **cnfswparms** on a BPX 8600-series switch to configure connection parameters for the network segment of a three-segment connection. For a stand-alone application, use whatever means are supported by the backbone switches.

cnfswparms <*chan_num*> <*mastership*> <*vpcflag*> <*conn_service_type*> (=cos) <*route_priority*> <*max_cost*> <*restrict_trunk_type*> <*pcr*> <*mcr*> <*pct_util*>

- *chan_number* is the channel (connection) number and is always 32.
- *mastership* specifies the current endpoint as master or slave. 1=master. 2=slave (default)
- *vpcflag* indicates whether the connection is a VPC or a VCC: 1=VPC, and 2=VCC.
- *conn_service_type* selects the type of service for the connection: 1=cbr, 2=vbr, 3 is not used, 4=ubr, 5=atfr, 6=abrstd, and 7=abrfst.

- *route_priority* is the priority of the connection for re-routing. The range is 1–15 and is meaningful only in relation to the priority of other connections.
- *max_cost* is a number establishing the maximum cost of the connection route. The range is 1–255 and is meaningful only in relation to the cost of other connections.
- *restrict_trunk_type* is a number that specifies the type of trunk this connection can traverse. The numbers are 1 for no restriction, 2 for terrestrial trunk only, and 3 for satellite trunk only.
- *pcr* is the peak cell rate in cells per second (cps). For T3, the maximum is 118980 cps. For E3, the maximum is 91405 cps.
- *mcr* is the minimum cell rate. The range is 1–65535 cells per second.
- *pct_util* is the percent utilization in the range 1–100.

Bit Error Rate Testing on a T3 or E3 CESM

An active MGX-CESM-T3 or MGX-CESM-E3 can perform a bit error rate test (BERT). Each of these cards contains its own BERT controller, so BERT sessions can run on any number of these cards in the system. However, only one user at a time can run BERT on a card. BERT disrupts service because it requires the tested path to be in loopback mode.

The CLI commands (whose functions correspond to CiscoView selections) appear in the following list. The correct order of task execution is crucial for obtaining valid results. With the exception of **dspdsx3bert**, you must execute the commands in the order they appear in the following list. You can execute **dspdsx3bert** before, during, or after a session. Because the order of execution is crucial, read the command descriptions whether you use the CiscoView application or the CLI.

- **acqdsx3bert** determines if another user currently is running a BERT session on the card.
- **startdsx3bert** starts a BERT test (after resetting BERT counters).
- **cnfdsx3bert** specifies a pattern for the BERT test.
- **moddsx3bert** injects multi-rate errors into the BERT bit stream.
- **deldsx3bert** ends the current test (and retains the values in the BERT counters). This command also resets the status of current users that **acqdsx3bert** detects.
- **dspdsx3bert** displays the parameters and results of the current test. You can execute this command at any time.

See the *Cisco MGX 8850 Wide Area Edge Switch Command Reference* for command details.

Note When a BERT session begins, all the connections on the line go into alarm and return to normal when you end the test. Consequently, the test may result in a large number of traps and other types of traffic (such as AIS).

Eight-Port Circuit Emulation Service Modules

The main function of the Circuit Emulation Service Module (CESM) is to provide a constant bit rate (CBR) circuit emulation service by converting data streams into CBR AAL1 cells for transport across an ATM network. The CESM supports the CES-IS specifications of the ATM Forum.

The eight-port CESM lets you configure individual physical ports for structured or unstructured data transfer. The card sets consist of an MGX-CESM-8T1 or MGX-CESM-8E1 front card and one of the following back cards:

- RJ48-8T1
- R-RJ48-8T1 for supporting 1:N redundancy through the optional MGX-SRM-3T3
- RJ48-8E1
- R-RJ48-8E1 for supporting 1:N redundancy through the optional MGX-SRM-3T3
- SMB-8E1

Structured Data Transfer

If you configure an individual port for structured data transfer, the eight-port CESM supports:

- Synchronous timing.
- Superframe or Extended Superframe for T1.
- *N* x 64 Kbps, fractional DS1/E1 service (contiguous time slots only). You can map an *N* x 64-Kbps channel to any VC.
- CAS robbed bit for T1 (ABCD for ESF and SF frames) and CAS for E1 (channel 16).
- CCS channel as a transparent data channel.
- A choice of partial-fill payload sizes.
- Idle detection and suppression for 64-Kbps CAS connections.
- Loopback diagnostics on a line or a connection (**addlnloop**, **tstcon**, and **tstdelay** commands).
- Bit error rate test (BERT) functionality with loopback pattern generation and verification on individual lines or logical port. For a description of the BERT functions, see the section titled “Bit Error Rate Testing Through an MGX-SRM-3T3.”

Unstructured Data Transfer

If you configure an individual port for unstructured data transfer, the eight-port CESM supports:

- Synchronous or asynchronous timing at T1 (1.544 Mbps) or E1 (2.048 Mbps) rates. For asynchronous timing, you can select its basis as either SRTS and adaptive clock recovery.
- The special port type *framingOnVcDisconnect*. This port type prevents a remote-end CPE from going to LOF by placing a line in remote loopback mode when the CESM determines that a connection deletion or suspension occurred at the network-side ATM interface.
- Ability to detect and display a yellow alarm for the ESF framing on a T1 line.
- Loopback diagnostics on a line or a connection (**addlnloop**, **tstcon**, and **tstdelay** commands).
- Bit error rate test (BERT) functionality with loopback pattern generation and verification on individual lines. For a description of BERT functions, see the section “Bit Error Rate Testing Through an MGX-SRM-3T3.”

Cell Delay Treatment

For each connection, you can configure a tolerable variation in the cell arrival time (CDVT) according to the expected reliability of the route. The CDVT applies to the receive buffer. After an underrun, the receiver places the contents of the first cell to arrive in a receive buffer then plays it out at least one CDVT value later. For each VC, the maximum cell delay and CDVT (or jitter) are:

- For T1
  - Cell delay of 48 msec
  - CDVT of 24 msec in increments of 125 microseconds
- For E1
  - Cell delay of 64 msec
  - CDVT of 32 msec in increments of 125 microseconds

Redundancy Support for the Eight-Port CESM

The MGX-CESM-8T1 and MGX-CESM-8E1 can have 1:N redundancy support but with some variations between the T1 and E1 modes of operation. The type of redundancy and the type of back card are interdependent. See “Service Resource Module” for more details. In general:

- With an RJ48-8T1, an MGX-SRM-3T3 can provide 1:N redundancy through the distribution bus or the redundancy bus.
- With an RJ48-8E1, an MGX-SRM-3T3 can provide 1:N redundancy through the redundancy bus.

Back card requirements for the MGX-SRM-3T3 and service modules vary, as follows:

- If you are using the MGX-SRM-3T3 for *bulk distribution* of T1 channels, the CESMs do not use back cards, but each MGX-SRM-3T3/B must have an MGX-BNC-3T3-M back card. (Bulk distribution is not available for E1 operation.)
- If the MGX-SRM-3T3/B supports T1 or E1 1:N redundancy through the *redundancy bus* (no bulk distribution), the MGX-SRM-3T3/B does not require a back card, but the *N* CESM primary cards must have one redundant version of the back card.

Error and Alarm Response

When it detects a loss of signal (LOS) alarm, the CESM notifies the connected CPE in the upstream direction after an integration period. The CESM continues to emit cells but sets the ATM cell payload with an appropriate data pattern as specified by the ATM Forum CES V2.0 specification. Also, an OAM cell with RDI code goes to the far end to indicate out-of-service. See Table 6-4.

Table 6-4 CESM Errors and Alarms

Error	Alarm Type	Down stream	Up Stream	Comments
Link Failure (RX)	Blue (LOS)	AIS—OAM cells	none	Data cells According to ATM-Forum CES-IS V 2.0
Receive RAI	Yellow	None	None	
Receive LOF		n/a	n/a	.
Receive AIS	Blue (AIS)	AIS (link)	FERF OAM cells	AIS over the T1 link or alternating 1s and 0s E1 link.

Configuring Service on an Eight-Port CESM

This section describes the steps for setting up a CESM and adding connections. The maximum number of connections is 248 on the MGX-CESM/B-8E1 and 192 on the MGX-CESM/B-T1. Use either the CLI or the Cisco WAN Manager application to set up a CESM and add connections. The following list shows the fundamental tasks and applicable CLI commands:

- Optionally configure redundancy at the card level (**addred** and possibly **addlink** on the PXM)
- Optionally modify resource partitions at the card level (**cnfcdrscprtn**)
- Activate a physical line (**addln**) and optionally configure the line (**cnfln**)
- Create logical ports for structured data transport on a physical line (**addport**)
- Optionally modify resource partitions at the port level (**cnfportrscprtn**)
- Add connections by using **addcon** (or **addchan** if NSAP addressing is necessary)

For CESM-related commands, see the list of service module commands at the beginning of the *Cisco MGX 8850 Wide Area Edge Switch Command Reference*. Also, each command description in the command reference lists related commands. For example, it shows display commands that relate to addition commands.

Configuring the Card, Lines, and Ports

This section describes how to configure parameters for the card, lines, and ports through the CLI. If you use the CiscoView application, refer to the CiscoView documentation. On the CLI, the command sequence is:

Step 1 **addln** <*line number*>

where *line number* is in the range 1–8. You can modify line characteristics with **cnfln**.

Step 2 Optionally execute **cnfln** to modify line characteristics from the defaults. (Use **dspln** or **dsplns** to check). The syntax for **cnfln** is:

cnfln <*line_num*> <*line_code*> <*line_len*> <*clk_src*> [*E1-signalin*g]

- *line_num* is a line number in the range 1–8.
- *line_code* is a number that specifies the line coding: 2=B8ZS (T1), 3=HDB3 (E1), and 4=AMI (T1/E1)
- *line_len* is the line length: 10-15 for T1, 8 for E1 with SMB line module, 9 for E1 with RJ48 line module
- *clk_src* is a number specifying the clock source: 1 for loop clock, 2 for local clock
- *E1-signallin*g specifies the E1 signaling. The possible entries are:
  - — CAS, which specifies CAS and no CRC
  - — CAS_CRC, which specifies CAS with CRC
  - — CCS, which specifies CCS and no CRC
  - — CCS_CRC, which specifies CCS with CRC
  - — CLEAR: CLEAR channel

Step 3 Create a logical port with **addport** if the application requires *N* x 64-Kbps channels:

addport <*port_num*> <*line_num*> <*begin_slot*> <*num_slot*> <*port_type*>

- *port_num* is the logical port number in the range 1–192 for T1 or 1–248 for E1
- *line_num* is the number of the physical line in the range 1–8.
- *begin_slot* is the beginning timeslot number in the frame: for T1, 1–24. For E1 2–32 with CCS signaling or 2–16 and 17–32 with CAS signaling.
- *num_slot* is the number of timeslots in the frame for the current port (*port_num*).
- *port_type* is: 1=structured, 2=unstructured, 3=framing on VC disconnect.

Step 4 Configure resources at the port level as needed by executing **cnfportrscprtn**:

cnfportrscprtn <*port_num*> <*controller_name*>

- *port_num* is the logical port number in the range 1–192 for T1 or 1–248 for E1.
- *controller_name* is the name of the network control application. Enter one of the following strings: PAR, PNNI, or MPLS.

Configuring Bulk Distribution and Redundancy

You can configure either bulk distribution or redundancy or both according to the restrictions in "Redundancy Support for the Eight-Port CESM." On the CLI of the PXM, execute **addlink** for bulk distribution (T1 only) before you execute **added** for redundancy. To configure bulk distribution:

- Execute **addlink** to create the links:

  addlink <*T3 line number*> <*T1 line number*> <*Target Slot number*> <*Slot line number*>

T3 line number	is the MGX-SRM-3T3/B line number in the format *slot.line*. The *slot* can be 15 or 31. The range for *port* is 1–3
T1 line number	is the starting T1 line number within the T3 line. The range for the T1 line number is 1–28.
Target Slot number	is slot number for the T1 service module.
Slot line number	is T1 line number in the range 1–8.

- Execute **addred**:

  addred <*redPrimarySlotNum*> <*redSecondarySlotNum*> <*RedType*>

redPrimarySlotNum	is the primary slot. For the redundancy bus (no bulk distribution), valid slot numbers are 1–6, 9–14, 17–22, and 25–30. With bulk distribution of T1 channels, do not specify 9, 10, 26, or 26.
redSecondarySlotNum	is the secondary slot. For the redundancy bus (no bulk distribution), valid slot numbers are 1–6, 9–14, 17–22, and 25–30. With bulk distribution of T1 channels, do not specify 9, 10, 26, or 26.
RedType	is the type of redundancy. A 1 specifies 1:1 for E1 with SMB connectors. A 2 specifies 1:N for T1 or E1.

Adding and Modifying Connections

Use either the Cisco WAN Manager application or the CLI to add or modify connections. If you use the WAN Manager application, refer to the *Cisco WAN Manager Operations Guide*.

This section describes how to add a connection to a PXM in a stand-alone node according to the rules for a standard connection or a management connection in the form of either a three-segment connection or a DAX con. See "Rules for Adding Connections" earlier in this chapter. The preferred command is **addcon**. If the application requires NSAP addressing, use **addchan** to add the connection and **cnfchan** if you need to modify it. Refer to the command reference for the syntax. On the CESM CLI:

Step 1 Add a connection through the preferred command **addcon**. (Alternatively, you can use **addchan** if your application requires the NSAP format of endpoint specification.)

Execute **addcon** at both ends of the connection—unless the remote endpoint is on port 34 of a PXM (see the note at the end of this step). The maximum number of connections for the MGX-CESM-8T1 is 248 and 192 for the MGX-CESM-8E1. Note that, because you can add only one connection per port, **addcon** does not request a connection number.

The system automatically assigns the next available *channel number*, so the **addcon** command does not require it. However, some related commands require a channel number. To see the channel number after you add a connection, use **dspcons**.

The syntax for **addcon** is:

addcon <*port_num*> <*sig_type*> <*partial_fill*> <*cond_data*> <*cond_signalling*> [*controller_type*] [*mastership*] [*remoteConnId*]

- *port_num* is the logical port number. This port must already exist (see **addport**).
- *sig_type* is a number indicating the type of signaling: 1 specifies basic signaling, 2 specifies E1 CAS, 3 specifies ds1SFCAS (DS1 Superframe CAS), and 4 specifies ds1ESFCAS (DS1 Extended Superframe CAS).
- *partial_fill* is a number representing the number of bytes in a cell. It can be either 0 to specify that the cell must contain 48 bytes or a non-0 value that fixes the number of bytes in each cell. For structured E1, the *partial_fill* range is 20–47 bytes. For structured T1, the range is 25–47 bytes. Unstructured T1 or E1 can be 33–47 bytes.
- *cond_data* is the conditioning data in case of loss of signal (LOS). It is always 255 for unstructured data transfer or 0–255 for structured data transfer. For a voice connection, the larger the *cond_data* value, the louder the hiss heard in case of LOS.
- *cond_signalling* is the string of condition signaling bits that you specify with a decimal number in the range 0–15, where, for example, 15=1111, and 0=0000. These bits represent the ABCD signaling to the line or network when an underflow occurs.
- *mastership* indicates whether this endpoint is the master or slave. 1=master. 2=slave (default).
- *remoteConnId* is the identification for the connection at the slave end. The format is *nodename.slot_number.port_number.vpi.vci.*

Step 2 Optionally, you can use **cnfcon** to modify an individual connection. This command requires a channel number. If you add a connection by using **addcon**, you do not need to specify a channel number because the system automatically uses the next available number. To obtain the channel number for **cnfcon**, execute **dspcons**.

cnfcon *<port_num>* *<CDVT>* *<CLIP>* *<bufsize>* *<cbrclkmode>* *<isenable>* *<exttrigis>*

- *port_num* is the port number.
- *CDVT* is a tolerable variation for the arrival time of cells. For T1, the range is 125–24000 micro seconds. For E1, the range is 125–26000 micro seconds. Both require 125-microsecond increments.
- *CLIP* is CellLossIntegrationPeriod, an amount of time a connection can be in an error condition before an alarm is declared. The range is 1000-65535 milli seconds.
- *bufsize* is the egress buffer size in bytes. These buffers are used for tolerating variations in the cell delay. The size can be automatically computed, or you can enter a specific size in bytes.
- *cbrclkmode* is the clock mode for a circuit emulation connection. The values are 1–3. 1 is synchronous. 2 is SRT. 3 is adaptive. SRT and adaptive are asynchronous clocking schemes.
- *isenable* is a flag to enable the idle code (ABCD signalling bits) based cell suppression feature on a connection. If you enable this feature, idle suppression logic is activated so that suppression begins when valid idle ABCD bits are detected. This feature is valid for only single DS0 connections. Possible values are 1 to enable and 2 to disable.
- *exttrigis* is an enable for an external idle suppression trigger. With this feature enabled, the logic forcefully suppresses cells on a single DS0 connection. Enter a 1 to disable idle suppression or a 2 to enable idle suppression.

Step 3 Optionally, you can configure connection parameters for the network segment of a three-segment connection:

cnfswparms *<chan_num>* *<mastership>* *<vpcflag>* *<conn_service_type>* (=cos) *<route_priority>* *<max_cost>* *<restrict_trunk_type>* *<pcr>* *<mcr>* *<pct_util>*

- *chan_number* is the connection in the range 32–279.
- *mastership* specifies the current endpoint as master or slave. 1=master. 2=slave (default)
- *vpcflag* indicates whether the connection is a VPC or a VCC: 1=VPC, and 2=VCC.
- *conn_service_type* selects the type of service for the connection: 1=cbr, 2=vbr, 3 is not used, 4=ubr, 5=atfr, 6=abrstd, and 7=abrfst.
- *route_priority* is the priority of the connection for re-routing. The range is 1–15 and is meaningful only in relation to the priority of other connections.
- *max_cost* is a number establishing the maximum cost of the connection route. The range is 1–255 and is meaningful only in relation to the cost of other connections.
- *restrict_trunk_type* is a number that specifies the type of trunk this connection can traverse. The numbers are 1 for no restriction, 2 for terrestrial trunk only, and 3 for satellite trunk only.
- *pcr* is the peak cell rate.
- *mcr* is the minimum cell rate. The range is 1–65535 cells per second.
- *pct_util* is the percent utilization in the range 1–100.

Service Resource Module

This section describes how to use the features of the T3 version of the Service Resource Module (MGX-SRM-3T3/B). This multipurpose card can provide:

- De-mulitplexing of T3 service called *bulk distribution.*
- 1:*N* redundancy support for service modules with T1 or E1 lines.
- Bit error rate testing (BERT) for T3, E3, T1, E1, fractional T1, or subrate operation with loopback pattern generation and verification on individual lines or logical port. For a description of the BERT functions, see the section titled "Bit Error Rate Testing Through an MGX-SRM-3T3."

An MGX-SRM-3T3/B installation requires at least one card set in the upper bay of the card cage and one card set in the lower bay. Each set services one half of the backplane. The PXM in slot 7 controls the SRMs in slots 15 and 31. The PXM in slot 8 controls the redundant SRMs in slots 16 and 32. If the switch has SRMs with redundant PXMs, the SRMs must occupy all the reserved slots for this feature—15, 16, 31, and 32.

Configuring Card and Line Parameters

You can configure card and line-level parameters for an SRM through the CiscoView application or the CLI on the PXM (not the SRM itself. For descriptions of the commands, see the *Cisco MGX 8850 Wide Area Edge Switch Command Reference*. The CLI commands that apply to the SRM are:

- **addln**
- **delln**
- **cnfln**
- **dspln**
- **dsplns**
- **addlmiloop**
- **dellmiloop**
- **cnfsrmclksrc**
- **dspsrmclksrc**
- **dspalm**
- **dspalms**
- **dspalmcnt**
- **clralmcnt**
- **clralm**
- **dspalmcnt**
- **addlink**
- **dsplink**
- **dellink**
- **addred**
- **dspred**
- **delred**

Bulk Distribution for T1 Service

The MGX-SRM-3T3/B supports a de-mulitplexing function called *bulk distribution*. With bulk distribution, the MGX-SRM-3T3/B converts traffic from its T3 lines to T1 channels and sends the data streams across the *distribution bus* to the appropriate service modules. The benefit of this feature is that the number of T1 cables and back cards is greatly reduced. Applicable service modules are the MGX-AUSM/B-8T1, AX-FRSM-8T1, and MGX-CESM-8T1.

At its MGX-BNC-3T3-M back card, the MGX-SRM-3T3/B connects to an external multiplexer. The multiplexer connects to the T1 lines from user-equipment and places the data streams on T3 lines to the MGX-SRM-3T3/B. Each T3 line can contain 28 T1 channels. An individual MGX-SRM-3T3/B can support 10 card slots, so the maximum number of T1 channels it can process is 80.

Linking the MGX-SRM-3T3/B to a destination card causes the switch to take CPE traffic through the MGX-SRM-3T3/B rather than the T1 card's line module. Linkage is a card-level condition. If you link just one T1 channel on a service module to the MGX-SRM-3T3/B, the back card on the service module becomes inoperative, so you must link all other T1 ports on that service module to the MGX-SRM-3T3/B if you want them to operate. Linking T1 ports into a group does not form an *N* X T1 channel. Each T1 channel remains a distinct T1 channel. Furthermore, a group belongs to one slot, so it cannot include T1 channels belonging to another card.

For a description of how the MGX-SRM-3T3/B supports redundancy for linked channels, see the section "Redundancy Support by the MGX-SRM-3T3/B" in this chapter.

Before configuring bulk distribution on an SRM, perform the following tasks:

1. Activate the lines (**addln** on the CLI).
2. Optionally configure the lines (**cnfln** on the CLI).
3. Display the state of the lines (**dspln** and **dsplns** on the CLI).

To link T1 ports on a service module to a T3 line on an MGX-SRM-3T3/B:

- Execute **addlink** on the active PXM. Related commands are **dsplink** and **dellink**.

  addlink <*T3 line number*> <*T1 slot*> <*NumberOfT1s*> <*TargetSlotLineNum*>

T3 line number	is the line number in the format *slot.line,* where *slot* is 15 or 31 (regardless of whether redundant SRMs exist in slots 16 and 32), and the range for *line* is 1–3.
T1 slot	is the start T1 line number within the T3 line (range 1–28).
NumberOfT1s	is the slot number of the T1 service module. *Target Slot number* can be 1-6, 11-14, 17-22, or 27-30.
TargetSlotLineNum	is the T1 line number in the linked card slot. The range is 1–8.

Redundancy Support by the MGX-SRM-3T3/B

The MGX-SRM-3T3/B can provide redundancy to service modules with T1 or E1 lines. For E1 or T1 modules, it can provide redundancy through the *redundancy* bus. For T1 modules only, it can provide redundancy through the *distribution* bus. The *redundancy* and *distribution* buses impose different requirements, but the common requirement is that all primary and secondary cards supported by a particular MGX-SRM-3T3/B must reside on the same level of the card cage as that SRM.

The need for back cards and the choice of bus for redundancy support depends on whether the MGX-SRM-3T3/B must provide bulk distribution:

- With bulk distribution, the T1 service modules do not use back cards. The MGX-SRM-3T3/B uses the distribution bus to support redundancy.
- Without bulk distribution, the supported service modules must have back cards. The redundant card set requires a special redundancy back card (the R-RJ48-8T1 or R-RJ48-8E!). The primary card sets use standard back cards (RJ48-8T1 or RJ48-8E1).

With redundancy provided by the SRM, no Y-cables are necessary because the MGX-SRM-3T3/B itself passes the traffic to the redundant front card if a failure necessitates switchover. Conversely, any card with 1:1 redundancy supported by Y-cabling does not require an SRM. For example, the FRSM-VHS cards have 1:1 redundancy through a Y-cable. The MGX-SRM-3T3/B redundancy feature is particularly important for cards that do not have Y-cable redundancy—the T1 and E1 service modules.

Configuring Redundancy Through the Redundancy Bus

For redundancy that utilizes the redundancy bus, the characteristics are:

- Both the primary and the redundant front cards must have back cards. The secondary back card must be the version specifically designed to be redundant cards. Examples are the R-RJ48-8T1 and R-RJ48-8E1, where the first “R” means redundant.
- An MGX-SRM-3T3/B can redirect traffic for only one failed card at a time regardless of the number of redundant groups you have configured to rely on that MGX-SRM-3T3/B for redundancy.

To configure redundancy through the redundancy bus:

Step 1 Execute **addred** on the active PXM:

addred <*redPrimarySlotNum*> <*redSecondarySlotNum*> <*RedType*>

where:

redPrimarySlotNum	is slot number of the slot containing the primary card. The slot numbers are 1–6, 9–14, 17–22, and 25–30.
redSecondarySlotNum	is slot number of the slot containing the secondary card of the card pair. The ranges are 1–6, 9–14, 17–22, and 25–30.
RedType	is a number that specifies the type of redundancy. Enter a 1 to specify 1:1 redundancy. Enter a 2 to specify 1:*N* redundancy. Only an SRM can support 1:*N* redundancy.

Step 2 Check the redundancy status for all cards by using **dspred**.

To remove redundancy, use **delred**.

Configuring Redundancy Through the Distribution Bus

Redundancy by way of the distribution bus applies to T1 channels you linked for bulk distribution. For a redundancy configuration on the MGX-SRM-3T3/B that utilizes the distribution bus:

- No back cards are necessary.
- The MGX-SRM-3T3/B can support multiple switchovers for different 1: *N* redundancy groups.
- Slots 9, 10, 15, or 26 are not supported.

Before you specify redundancy with bulk distribution, linkage must exist between a T3 line on the MGX-SRM-3T3/B and a primary service module with the T1 lines. No linkage should exist on the secondary service module. To configure redundancy through the CLI:

Step 1 Execute **addred** on the active PXM:

addred <*redPrimarySlotNum*> <*redSecondarySlotNum*> <*RedType*>

where:

redPrimarySlotNum	is slot number of the slot containing the primary card. Permissible slot numbers are in the range 1–6, 11–14, 17–22, and 27–30.
redSecondarySlotNum	is slot number of the slot containing the secondary card of the card pair. Permissible slot numbers are in the range 1–6, 11–14, 17–22, and 27–30.
RedType	is a number that specifies the type of redundancy. Enter a 1 to specify 1:1 redundancy. Enter a 2 to specify 1:*N* redundancy. Only an SRM can support 1:*N* redundancy.

Step 2 Check the redundancy status for all cards by using **dspred**.

To remove redundancy, use **delred**.

Bit Error Rate Testing Through an MGX-SRM-3T3

The MGX 8850 switch can perform a bit error rate test (BERT) on an active line or port. This type of testing disrupts service because a BERT session requires the tested path to be in loopback mode. In addition, the pattern test replaces user-data in the path with the test pattern. The applicable line types and variations for a DS1 are:

- A T1 or E1 line
- Fractional portions of a T1 line that add up to a DS1
- A single 56-Kbps or 64-Kbps DS0
- A DS0 bundle consisting of *N* x 64-Kbps DS0s

With a set of MGX-SRM-3T3/B cards in the system, you can initiate a BERT session on an MGX-FRSM-2CT3 or any eight-port service module. (In contrast, the MGX-FRSM-2T3E3, MGX-CESM-T3, and MGX-CESM-E3 do not use the MGX-SRM-3T3/B for BERT. See the sections for these service modules in this chapter for applicable BERT.)

The MGX 8850 bus structure supports one BERT session per upper or lower bay, so the switch can run a maximum of two sessions at once. When you specify the target slot through the CiscoView application or the CLI, the system determines if a BERT configuration already exists in that bay. After the system determines that no BERT configuration exists in the applicable bay, the display presents a menu for the BERT parameters.

The CLI commands (whose functions correspond to CiscoView selections) are:

- **cnfbert** to configure and start a test
- **modbert** to inject errors into the BERT bit stream
- **dspbert** to display the parameters and results of the current test
- **delbert** to end the current test

Note When a BERT session begins, all connections on a line or port go into alarm and return to normal when the test ends. Consequently, the test may result in other types of traffic (such as AIS).

During configuration, the displayed parameters or menu items depend first on the card type and whether the test medium is a physical line or a logical port. Subsequent choices are test type, test patterns, loopback type, and so on. See the *Cisco MGX 8850 Wide Area Edge Switch Command Reference* for details on **cnfbert** and the other BERT commands. The concatenation of menu to menu is extensive, so this section contains tables of menu selections based on the card types and the test type.

The test type can be *pattern*, *loopback*, or *DDS seek*. The choice of test type leads to further menu displays. Following the tables of menu choices, the remaining sections define the parameters in these menu choices.

- For AX-FRSM-8T1, MGX-CESM-8T1, and MGX-FRSM-2CT3, see Table 6-5 pattern tests and Table 6-6 for loopback tests.
- For AX-FRSM-8E1 and MGX-CESM-8E1, see Table 6-7 for pattern tests and Table 6-8 for loopback tests.
- For MGX-AUSM-8T1, see Table 6-9 for pattern tests and Table 6-10 for loopback tests.
- For MGX-AUSM-8E1, see Table 6-11 for pattern and Table 6-12 loopback tests.

Table 6-5 Pattern Test for AX-FRSM-8T1, MGX-CESM-8T1, and MGX-FRSM-2CT3

Test Medium	Medium Type	Device to Loop	BERT Pattern
Port	Port with *N* timeslots (can also submit to the DDS seek test)	v54	all patterns
	Port with one 64-Kbps timeslot (can also submit to the DDS seek test)	latch or v54	all patterns
	Port with one 56-Kbps timeslot (can also submit to the DDS seek test)	noLatch	2^9 or 2^{11}
		latch or v54	all patterns
Line	n/a	in-band/ESF or metallic	all patterns

Table 6-6 Loopback Test for AX-FRSM-8T1, MGX-CESM-8T1, and MGX-FRSM-2CT3

Test Medium	Medium Type	Loopback
Port	Port with *N* timeslots (can also submit to the DDS seek test)	far end or remote
	Port with one 64-Kbps timeslot (can also submit to the DDS seek test)	far end or remote
	Port with one 56-Kbps timeslot (can also submit to the DDS seek test)	far end or remote
Line	n/a	metallic, far end, or remote

Table 6-7 Pattern Test for AX-FRSM-8E1 and MGX-CESM-8E1

Test Medium	Medium Type	Device to Loop	BERT Pattern
Port	any	none	all patterns
Line	n/a	metallic	all patterns

Table 6-8 Loopback Test for AX-FRSM-8E1 and MGX-CESM-8E1

Test Medium	Medium Type	Loopback
Port	any	remote loopback
Line	n/a	metallic or remote

Table 6-9 Pattern Test for MGX-AUSM-8T1

Test Medium	Medium Type	Device to Loop	BERT Pattern
Line	n/a	in-band/ESF	all patterns

Table 6-10 Loopback Test for MGX-AUSM-8T1

Test Medium	Medium Type	Loopback
Line	n/a	far end, remote, or metallic

Table 6-11 Pattern Test for MGX-AUSM-8E1

Test Medium	Medium Type	Device to Loop	BERT Pattern
Line	n/a	none	all patterns

Table 6-12 Loopback Test for MGX-AUSM-8E1

Test Medium	Medium Type	Loopback
Line	n/a	remote or metallic

Pattern Test Options

The pattern test options consist of the device to loop and the pattern. This section lists the device options and patterns that appear in the menus. Refer to the preceding tables as needed. The *device to loop* options identify the type of device that participates in the test:

- *noLatch* is a device that does not latch the data. It can be a:
  - Non-latching office channel unit (OCU) that consists of one device
  - Non-latching OCU that consists of a chain of devices
  - Non-latching channel service unit (CSU)
  - Non-latching data service unit (DSU)
- *Latch* is a device that can latch the data and can be a:
  - Latching DS0-DP drop device
  - Latching DS0-DP line device
  - Latching office channel unit (OCU)
  - Latching channel service unit (CSU)
  - Latching data service unit (DSU)
  - Latching HL96 device
- *in-band/ESF*
- *v54* is a polynomial loopback
- *metallic* is a local loopback within the service module and does not involve an external device

The available patterns are:

1. All 0s
2. All 1s
3. Alternating 1-0 pattern
4. Double 1-0 pattern
5. 2^{15}-1 pattern
6. 2^{20}-1 pattern
7. 2^{20}-1 QRSS pattern
8. 2^{23}-1 pattern
9. 1 in 8 pattern
10. 3 in 24 pattern
11. DDS-1 pattern
12. DDS-2 pattern
13. DDS-3 pattern
14. DDS-4 pattern
15. DDS-5 pattern
16. 2^{9} pattern
17. 2^{11} pattern

Loopback Test Options

The loopback tests do not monitor the integrity of the data but rather the integrity of the path. The type of loopback indicates the direction of test data transmission. The choices are:

- *far end* means the service module transmits data to the CPE and receives the data back
- *remote* means the service module receives data from the CPE and loops back to the CPE
- *metallic* means the service module receives data from the network and loops it back to the network